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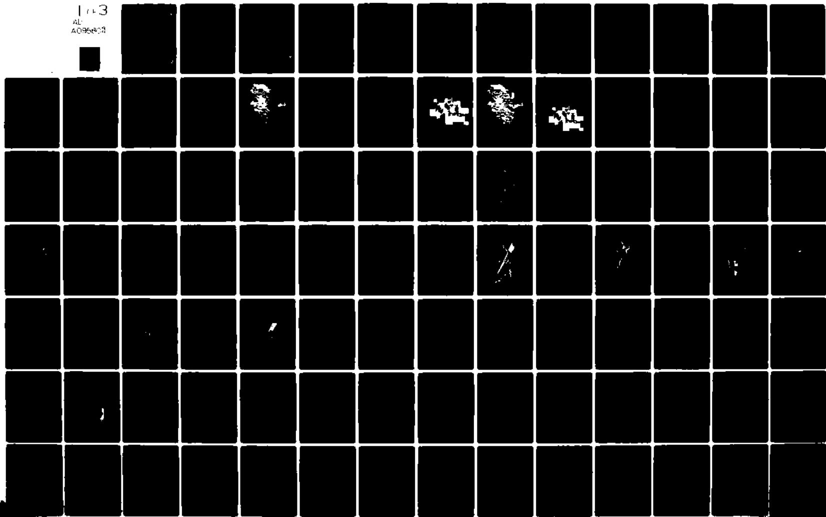

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This report identifies the enviornmental effects caused directly by construction of the system. The resultant indirect environmental impacts are described within the DEIS and detailed within other ETRs. Major effects due to construction of the system identified within this report are the requirements for land, water, materials and personnel as well as the locations, the timing and the magnitude of each of these resource requirements.

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M-X ETR-31

M-X ENVIRONMENTAL TECHNICAL REPORT: CONSTRUCTION

Prepared for

United States Air Force
Ballistic Missile Office
Norton Air Force Base
California

by

HDR Sciences
Santa Barbara, California

22 December 1980

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

INTRODUCTION

M-X deployment and related construction planning are still in the early stages with many detailed decisions yet to be made as outlined by the tiered decision-making process described in Section 1.7.2 of the DEIS. However, certain actions must be taken on an advanced schedule to meet the objective stated by Congress as ". . . the development of the M-X missile together with a new basing mode for such missile should proceed as to achieve Limited Operational Capability (LOC) for both such missile and such basing mode at the earliest practical date." One of these actions is on an advanced schedule selection of a deployment area or areas.

Construction of the shelter, roads, and bases create significant direct environmental effects which must be analyzed to determine the potential impacts to the natural environment and on the social and economic fabric of the deployment areas.

Construction planning covering personnel and material resource requirements specific in amount, time and place were estimated as described in this report to provide the information used in the environmental analysis reported in the EIS. These estimates were based on knowledge available at the time when this information was required for the DEIS schedule. Since that time more detailed plans have been made and new information has been developed on construction of M-X Basing Components. Using this information, new estimates have been prepared for the total number of workers required to construct the M-X Basing Facility by the Air Force and the Corps of Engineers who will manage facility construction.

In November 1980, a Task Force consisting of representatives of the Corps of Engineers, Air Force Engineers, and Air Force Contract Consultants was convened by the Air Force Regional Civil Engineer M-X at Norton AFB to seek agreement on this estimate for numbers and staging of construction workers. The results of this work are presented in Table 1. The "Task Force" figures represent an essential consensus of the three groups. There is no estimate of peak workers as the DEIS analysis employs averages rather than peak personnel strength. This recent work was completed too late for use in the EIS Analysis although its significance with regard to many aspects of the EIS is acknowledged. (It should be noted that all of the construction personnel estimates are based upon the assumption that each worker will work a standard 40-hour work week. A mitigation measure which is currently being studied is the use of longer work periods such as ten hour work days and six day work weeks. If implemented, this mitigation measure could significantly reduce the number of construction workers required.)

This report presents the basis for the "DEIS" estimates. They will be updated for use in the FEIS analysis by considering the most current plans and estimates at that time.

Table 1. Estimates of M-X construction workers.

	1982	1983	1984	1985	1986	1987	1988	1989
Average[1]								
Task Force	2,035	5,590	9,510	17,910	18,560	17,670	12,765	5,490
AF/DEIS	1,150	2,000	4,450	10,800	17,050	15,450	13,050	4,800
Peak[2]								
Task Force	2,912	6,608	13,440	20,216	22,288	21,560	15,008	8,512
AF/DEIS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

4106-1

[1]The average number of construction workers that will be present in the field over the course of an entire calendar year.

[2]The number of construction workers that will be present in the field during the month of peak construction activity.

1.0 OVERVIEW AND SUMMARY

This report identifies the environmental effects caused directly by construction of the system. The resultant indirect environmental impacts are described within the DEIS and detailed within other ETRs. Major effects due to construction of the system identified within this report are the requirements for land, water, materials and personnel as well as the locations, the timing and the magnitude of each of these resource requirements. The proposed and alternative systems are described in Chapter 2.

Chapter 3 describes in more detail each of the individual components which must be constructed. The sequencing of construction of the various parts of the system is contained in Chapter 4. Chapter 5 describes the method of construction of each of the components.

The overall project effects, evaluated in terms of resources required, are very similar for each of the alternatives. Table 1.0-1 summarizes these effects. (Appendices 2 through 5 present a layout schedule and breakdown of the project effects into smaller geographic units for the Proposed Action, and each alternative.)

The differences between the systems in Nevada/Utah and Texas/New Mexico are due, primarily to differences in the lengths of roads required. The ruggedness of terrain in the Nevada/Utah region leads to a more dispersed system and therefore longer roads than in Texas/New Mexico.

Because these overall project effects are similar, it must not be misinterpreted to mean that the environmental impacts are also similar. The same project effects acting in different areas may cause far different impacts. The impacts are discussed within the DEIS.

The design of the M-X system has gone through an evolutionary process that begin with a system of underground tunnels and finally evolved to the current design. Even this design is not final and will undoubtedly be refined further.

The system, as currently designed, will be composed of two operating bases, 200 clusters with 23 protective shelters each, and a system of interconnecting roads. The Proposed Action calls for placing the system in the Great Basin area of Nevada and Utah.

The specific designs of each of the project components are not yet completed and will not be for some time. Numerous studies are currently underway to develop the optimum design for each component as well as the schedule for construction. Moreover, the precise locations for each component have not yet been identified.

This analysis is based upon the preliminary designs and system layouts considered valid at the time of analysis and a representative, conceptual schedule. These component designs may be refined or modified to some extent before actual construction begins. They are considered sufficiently accurate to make an environmental analysis for deployment area selection.

Table 1.0-1. Construction resources by alternative.

CONSTRUCTION RESOURCE	ALTERNATIVE		
	P.A., 1-6	7	8
Disturbed Area (x 10^3 acres)	134-164	129-158	136-166
Water (x 10^3 acre-ft)	110-134	75-91	93-113[1]
Aggregate (x 10^3 cubic yards)	49,030-59,926	46,242-56,518	47,900-58,544
Steel (x 10^3 tons)	376-416	376-416	377-417
Cement (x 10^3 tons)	1,446-1,598	1,446-1,598	1,459-1,613
Asphaltic Oil (x 10^3 tons)	461-564	409-500	441-539
POL (x 10^6 gallons)	402-589	662-810	563-689
Electrical Energy (x 10^3 MWH)	680-832	905-1,106	832-1,016

3173

[1]Water numbers include irrigation for revegetation at shelters for Nevada/Utah region. Without revegetation, water requirements would be 70-100 x 10^3 acre-ft.

2.0 M-X SYSTEM DESCRIPTION AND ALTERNATIVES

2.1 INTRODUCTION

The M-X system consists of two operating base (OB) complexes and a designated deployment area (DDA). The makeup of the OB complexes and the DDA are generally dependent upon the deployment option selected. There are two deployment options for the M-X system and they are full basing and split basing.

Full basing is the deployment of the entire 200 missiles in 200 linear clusters (each cluster contains 23 protective shelters for a total of 4,600 shelters) in a two-state region. There are 2 two-state regions being considered: Nevada/Utah and Texas/New Mexico. Split basing is identical to full basing in that the total number of missiles, clusters and shelters are the same. However, the deployment is in both of the two-state regions, with one-half of the missiles in each region.

The OB complexes are classified as either a first or a second OB complex. The first OB complex always has an operating base (OB), a designated assembly area (DAA), an operating base test site (OBTS), and an airfield. The first OB complex is connected to the DDA by the designated transportation network (DTN). The second OB complex has an OB and an airfield for the full basing option, and it is not connected to the DDA. For split basing, the second OB complex has an OB, DAA and airfield. It is connected to the DDA by the DTN.

The main components of the DDA are the protective shelters, DTN, cluster roads, cluster maintenance facilities (CMFs), and remote surveillance sites (RSSs). Also located in the DDA are area support centers (ASCs), the total number of which is dependent upon whether the full or split basing option is selected. In some of the system alternatives, an ASC may be colocated with an OB complex.

There are nine system alternatives under consideration. Table 2.1-1 shows the OB complex locations and components for these alternatives. The distribution of protection shelters by state and by county for the alternatives is given in Table 2.1-2.

A schedule for construction in the DDA has been developed for each of the alternatives. These schedules describe a logical sequence of construction which begins at a marshalling yard or OB complex for each construction region and progresses at a rate that will allow the IOC and FOC deadlines to be met. The schedules associated with each alternative were used as input to a construction model to derive personnel and constuction resource requirements for construction in the DDA.

2.2 PROPOSED ACTION

The Proposed Action is a full basing deployment in the Nevada/Utah region. The 23 protective shelters in each cluster are arranged in a two-thirds filled hexagonal pattern and spaced a nominal 5,200 ft. apart. The first OB complex is located near Coyote Spring Valley, Nevada. The second OB complex is near Milford, Utah. Figure 2.2-1 shows the system layout for the Proposed Action.

The system ranges east-west from Tonopah, Nevada, to Delta, Utah; and north-south from approximately Eureka to Caliente, Nevada. Other communites in

Table 2.1-1. OB complex locations and components for Proposed Action and alternatives.

ALTERNATIVE	FIRST OB COMPLEX		SECOND OB COMPLEX	
	LOCATION	SYSTEM COMPONENTS	LOCATION	SYSTEM COMPONENTS
Proposed Action	Coyote Spring Valley, Nevada	OB, DAA, OBTS, Airfield	Milford, Utah	OB, Airfield
1.	Coyote Spring Valley, Nevada	OB, DAA, OBTS, Airfield	Beryl, Utah	OB, Airfield
2.	Coyote Spring Valley, Nevada	OB, DAA, OBTS, Airfield	Delta, Utah	OB, Airfield
3.	Beryl, Utah	OB, DAA, OBTS, Airfield	Ely, Nevada	OB, Airfield
4.	Beryl, Utah	OB, DAA, OBTS, Airfield	Coyote Spring Valley, Nevada	OB, Airfield
5.	Milford, Utah	OB, DAA, OBTS, Airfield	Ely, Nevada	OB, Airfield
6.	Milford, Utah	OB, DAA, OBTS, Airfield	Coyote Spring Valley, Nevada	OB, Airfield
7.	Clovis, New Mexico	OB, DAA, OBTS, Airfield	Dalhart, Texas	OB, Airfield
8.	Coyote Spring Valley, Nevada	OB, DAA, OBTS Airfield	Clovis, New Mexico	OB, DAA, Airfield
No Action	—	—	—	—

3601-2

Table 2.1-2. Distribution of protective shelters by state and county for Proposed Action (PA) and alternatives.

STATE/COUNTY	ALTERNATIVE		
	PA, 1-6	7	8
Nevada			
Esmeralda	138	—	—
Eureka	323	—	—
Lander	84	—	—
Lincoln	953	—	920
Nye	1,324	—	629
White Pine	437	—	36
Subtotal	3,259	—	1,585
Utah			
Beaver	189	—	188
Juab	314	—	17
Millard	754	—	510
Tooele	84	—	—
Subtotal	1,341	—	715
Region Total	4,600	—	2,300
Texas			
Bailey	—	126	14
Castro	—	137	—
Cochran	—	61	51
Dallam	—	690	190
Deaf Smith	—	574	242
Hartley	—	354	250
Hockley	—	16	14
Lamb	—	42	9
Oldham	—	74	41
Parmer	—	246	1
Randall	—	55	—
Sherman	—	39	—
Swisher	—	26	—
Subtotal	—	2,440	812
New Mexico			
Chaves	—	481	474
Curry	—	196	43
De Baca	—	137	115
Guadalupe	—	6	6
Harding	—	215	202
Lea	—	16	17
Quay	—	342	312
Roosevelt	—	542	164
Union	—	225	155
Subtotal	—	2,160	1,488
Region Total	—	4,600	2,300
TOTAL	4,600	4,600	4,600

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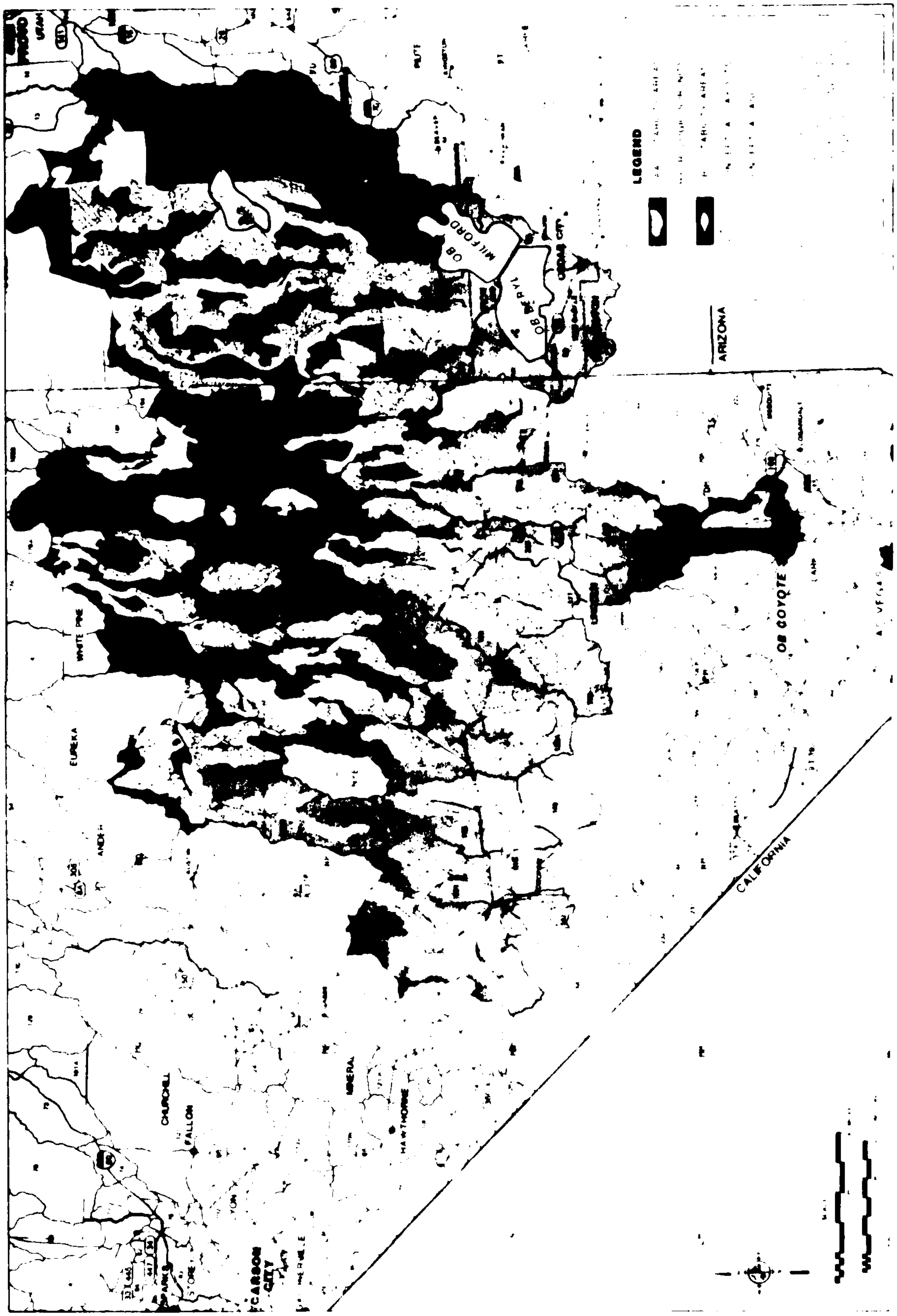

LEGEND
UTAH
ARIZONA
CALIFORNIA
OB MILFORD
OB BERYL
CEDAR CITY
OB COYOTE
WHITE PINE
EUREKA
CHURCHILL
FALLON
MINERAL
HAWTHORNE
CARSON CITY
SPARKS

the general vicinity of the DDA include Austin, Ely, Pioche, and Panaca, Nevada; and Hinckley and Milford, Utah. This system covers an approximate area of 12,200 sq.mi.

Major highways in the area include Federal Aid Primary Routes U.S.50, 6, and 93. State highways include 8A, 25, and 38 in Nevada; and 121 and 257 in Utah. Although not in the immediate area, Interstate 80 from Reno, Nevada to Salt Lake City, Utah; and Interstate 15 from Las Vegas, Nevada to Salt Lake City provide an important means of access to the region.

Roughly paralleling the above Interstate routes are the Union Pacific Railroad east-west mainline to San Francisco, California and another line from Salt Lake City, Utah to Las Vegas Nevada and Los Angeles, California. Also, a spur line runs south from the east-west mainline to Ely, Nevada.

For the Proposed Action, the DTN begins at the first OB complex near Coyote Spring Valley, Nevada and proceeds north to Dry Lake Valley, where it splits to the east and west. The eastern branch continues through Nevada to Utah, where it terminates in Sevier Desert Valley, north of Delta. The western branch continues to Railroad Valley, where it splits again; one portion continuing west to Big Smoky Valley and the other going north to Newark Valley, both in Nevada. This northern portion separates in Newark Valley with one branch proceeding west and terminating in Monitor Valley and the second branch going east and ending in Butte Valley. The total length of DTN is approximately 1,460 mi. About 6,200 mi. of cluster roads are needed.

2.3 ALTERNATIVES 1 THROUGH 6

Alternatives 1 through 6 are similar to the Proposed Action in that they are all a full basing deployment in the Nevada/Utah region using the same DDA. They vary in that there are different locations and combinations for the first and second OB complexes. Figure 2.2-1 also shows the system layouts for Alternatives 1 through 6.

Alternatives 1 and 2 are the same as the Proposed Action in that they have the same location for the first OB complex, near Coyote Spring Valley, Nevada. However, they have different sites for the second OB complex. Alternative 1 has the second OB complex near Beryl, Utah; and Alternative 2, near Delta, Utah. Alternatives 3, 4, 5, and 6 have the first OB complex located in Utah with the second OB complex in Nevada. A site near Beryl, Utah is the location for the first OB complex for Alternatives 3 and 4, while Alternatives 5 and 6 use a location near Milford, Utah. Alternatives 3 and 5 employ the same second OB complex site, near Ely, Nevada; and Alternatives 4 and 6 also use a common second OB complex location, near Coyote Spring Valley, Nevada.

2.4 ALTERNATIVE 7

Alternative 7 is similar to the Proposed Action and Alternatives 1 through 6 in that it is a full basing deployment in a single two-state region. Also, the 23 protective shelters in each cluster are arranged in a two-thirds filled hexagonal pattern and spaced a nominal 5,200 ft. apart. The two-state region used for deployment for Alternative 7 is Texas/New Mexico. The first OB complex is located near Clovis, New Mexico, the second OB complex near Dalhart, Texas. Figure 2.4-1 shows the system layout for Alternative 7.

In Texas/New Mexico, the full basing deployment area is bounded by Roswell, New Mexico on the southwest to approximately Dalhart, Texas on the northeast. Other major cities in the area include Amarillo and Lubbock, Texas. Counties in Texas where the system is proposed include Dallam, Sherman, Hartley, Randall, Oldham, Deaf Smith, Parmer, Castro, Swisher, Bailey, Lamb, Cochran, and Hockley. New Mexico counties include Union, Harding, Quay, De Baca, Roosevelt, Curry, Chaves, Guadalupe, and Lea. This system has a total approximate area of 11,320 sq.mi.

Interstate 40, between Albuquerque, New Mexico and Amarillo, Texas essentially bisects the system. Major Federal Aid Primary Routes include U.S.54, 60, 70, 84, 380, and 385.

The DTN branches from the first OB complex to the DDA in two directions. A northerly branch parallels much of the existing road system and separates frequently to access clusters in Texas and New Mexico. The southerly extension picks up clusters in New Mexico and then turns east to provide access to the remaining clusters in Texas.

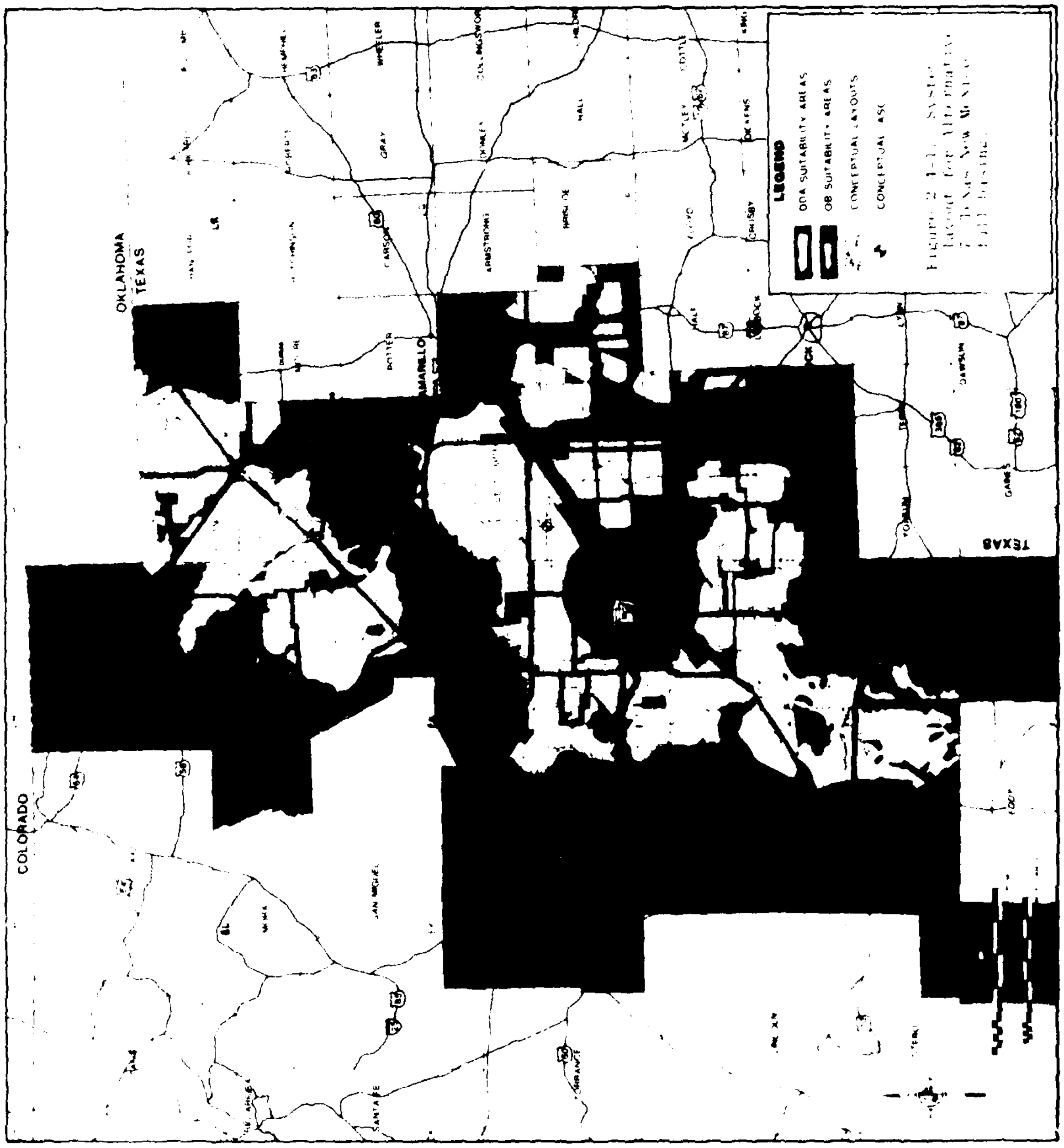
The DTN is approximately 1,260 mi. long. About 5,940 mi. of cluster roads are required. Much of the Texas/New Mexico siting region contains section roads at one mile intervals. Where they are available they are used as cluster roads to minimize road construction and environmental impact. Approximately 1,300 mi. of cluster roads will coexist with the present road system. The total road network for Alternative 7 is approximately six percent less than that for the Proposed Action.

2.5 ALTERNATIVE 8

Alternative 8 is a split basing deployment in the Nevada/Utah/Texas/New Mexico region. As is the case with the Proposed Action and all the other alternatives, the 23 protective shelters in each of the 200 clusters are arranged in a two-thirds filled hexagonal pattern and spaced a nominal 5,200 ft. apart. One hundred clusters are located in the Nevada/Utah region with the first OB complex near Coyote Spring Valley, Nevada. The remaining 100 clusters are in the Texas/New Mexico region with the second OB complex near Clovis, New Mexico. The system layout for Alternative 8 is shown in Figures 2.5-1 (Nevada/Utah) and 2.5-2 (Texas/New Mexico).

The Nevada/Utah portion of the system extends from Moapa, Nevada on the south, to Delta, Utah on the north. Other major cities in the area include Caliente, Pioche, and Panaca, Nevada; and Beryl, Milford, Delta, and Hinckley, Utah. White Pine, Nye, and Lincoln counties in Nevada; and Juab, Millard, and Beaver counties in Utah are affected by this alternative. This portion of the system covers an approximate area of 6,450 sq.mi.

The Texas/New Mexico portion extends from southern Chaves County, New Mexico to northern Dallam County, Texas. Other affected counties include Guadalupe, Harding, Lea, Roosevelt, Union, Quay, De Baca, and Curry counties in New Mexico; and Parmer, Bailey, Lamb, Deaf Smith, Hartley, Oldham, Cochran, and


LEGEND
DDA SUITABILITY AREAS
OB SUITABILITY AREAS
CONCEPTUAL LAYOUTS
CONCEPTUAL ASC
OKLAHOMA
TEXAS
COLORADO
AMARILLO
WHEELER
GRAY
CARSON
POTTER
ARMSTRONG
DONLEY
HALL
CRISBY
DAWSON
GAINES
SAN MIGUEL
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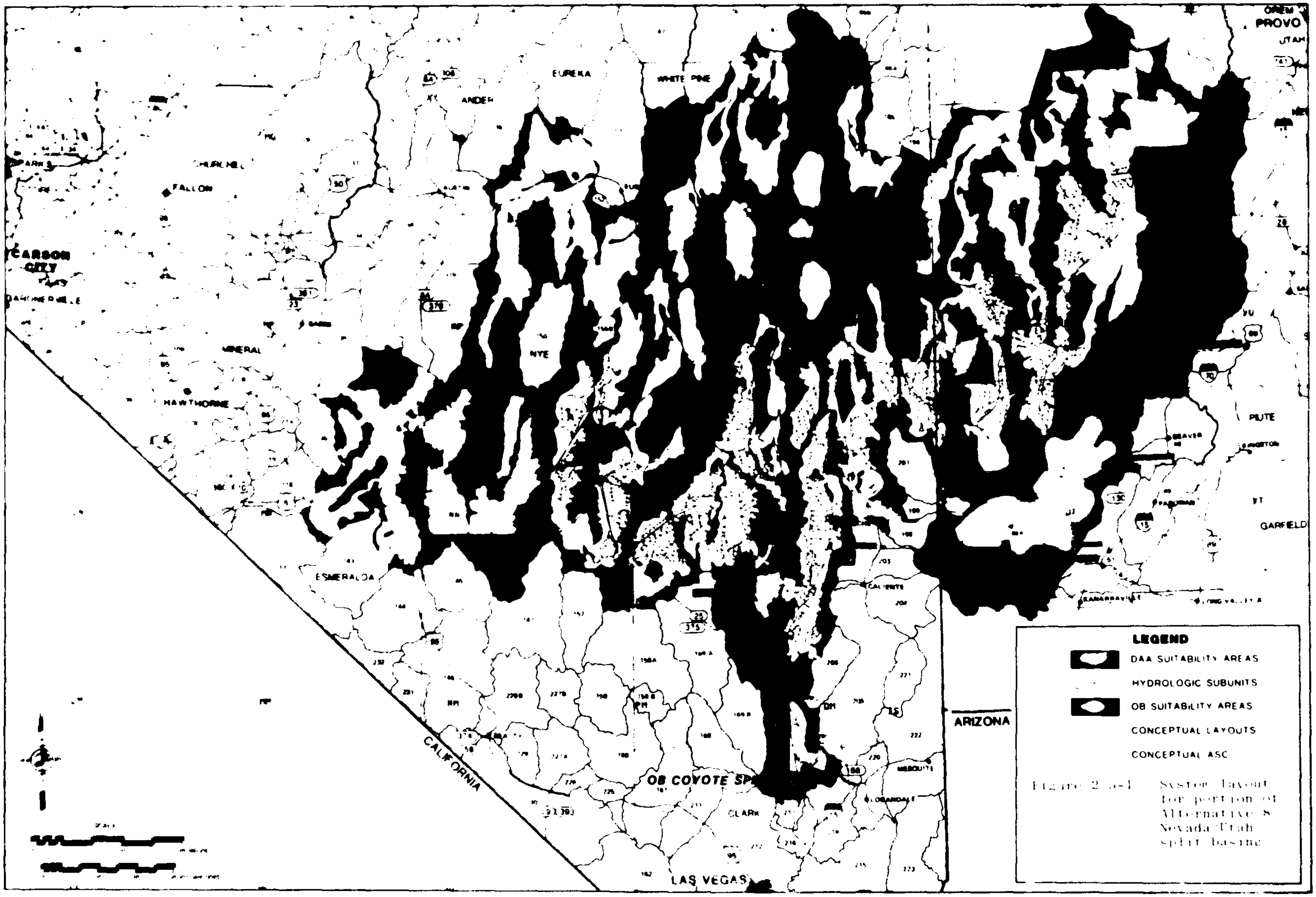


Figure 2.3-1 System layout for portion of Alternative 8 Nevada/Utah split basing

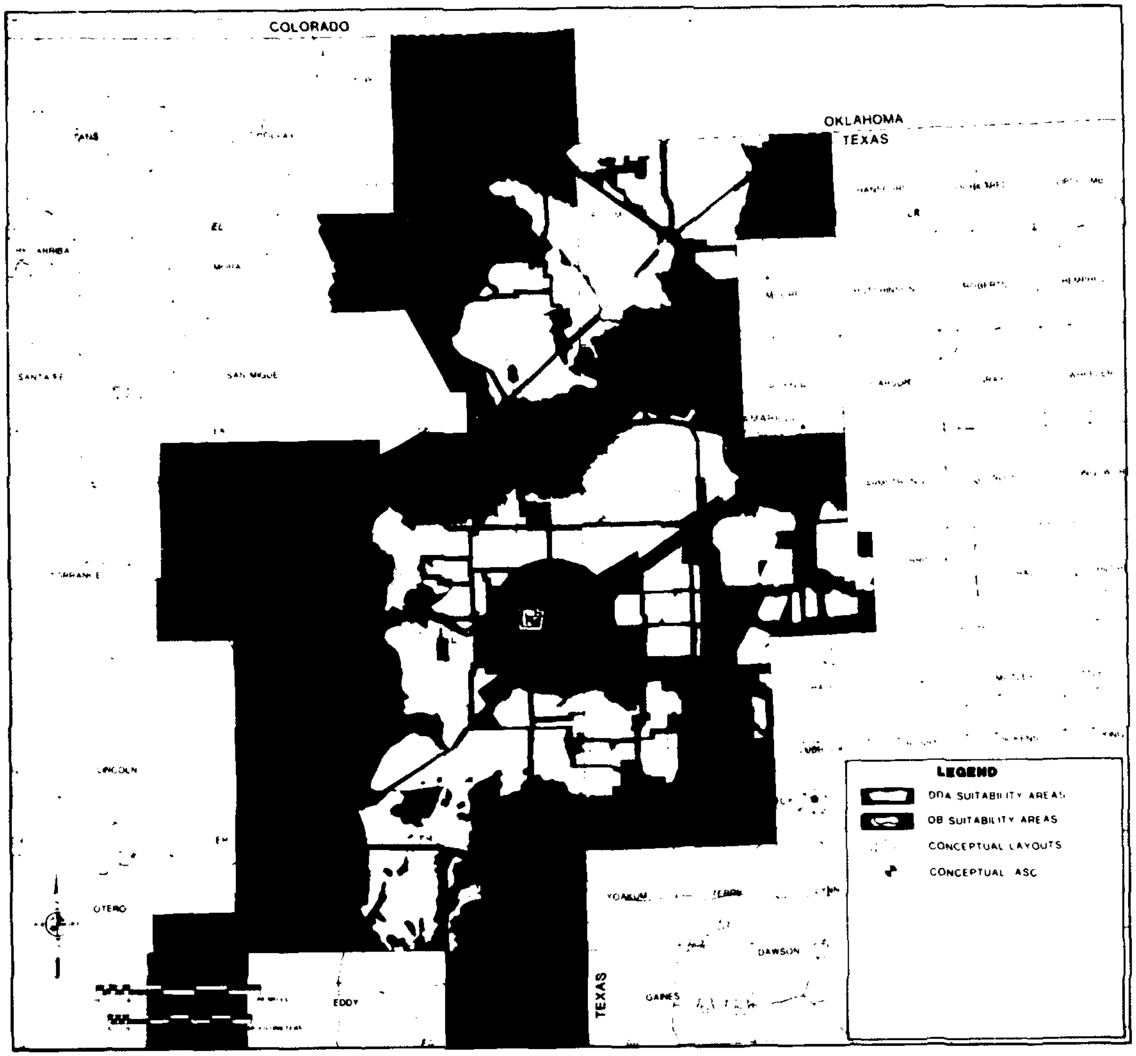


Figure 2.5-2. System layout for portion of *Alternative 8*, Texas/New Mexico split basing.

Hockley in Texas. Principal cities in the area include Clovis, New Mexico and Dalhart, Texas. Amarillo and Lubbock, Texas lie outside the area, just to the east of the DDA. The Texas/New Mexico portion of the system covers approximately 6,240 sq.mi. for a total of about 12,690 sq.mi. required for this alternative.

Major Federal Aid Primary highways include U.S. Routes 6, 50, and 93 in the Nevada/Utah region; and 54, 87, 380, 60, 70, 84, and 385 in the Texas/New Mexico region. Combined Interstate 40 - U.S. Route 66 approximately bisects the DDA in Texas/New Mexico.

In the Nevada/Utah portion of the system, the DTN originates near Coyote Spring Valley, Nevada and proceeds north to Dry Lake Valley, where it branches to the east and west to access the remaining clusters. Essentially, this system duplicates a portion of the deployment area shown for the Proposed Action with approximately 70 clusters in Nevada and 30 in Utah.

Similarly, in Texas/New Mexico, the DTN follows the same alignment used in the Texas/New Mexico full basing system (Alternative 7). The DDA for Alternative 8 is a portion of the DDA for Alternative 7, with approximately 35 clusters located in Texas and 65 in New Mexico.

A total of 1,380 mi. is estimated for the DTN. Cluster road construction will total about 6,070 mi.

3.0 DESCRIPTION OF SYSTEM COMPONENTS

The construction of the M-X system is a large undertaking encompassing parts of two or four states and requiring approximately eight years to complete. Within the system various types of facilities are needed. The major facilities--two operating base complexes, 4,600 protective shelters, and a variable length of road comprise the main work items for construction (see Figure 3.0-1).

3.1 OPERATING BASE (OB) COMPLEXES

The two OB complexes are referred to as the first and second OB complexes. The major facilities in the first OB complex include the operating base (OB), the designated assembly area (DAA), and the operational base test site (OBTS). Regardless of the siting alternative selected, full or split based, the first OB complex will always contain those major facilities. The second OB complex has only an OB when the siting alternative is full based. When the split based alternative is selected, the second OB complex will also include a DAA. In no case is there even an OBTS located in the second OB complex.

The OB provides operational control, maintenance, supply, rail/air offloading facilities, and other typical base support functions as well as housing and facilities for assigned personnel and families. The operations control center (OCC) will be located on the first OB while the alternate OCC (AOCC) will be located on the second OB. The OB technical support facilities consist of OCC and AOCC, telephone exchange, electronic maintenance labs, missile guidance and control (G&C) system facility, warehouses, electrical/mechanical maintenance facilities, and security response force facility. In addition to these technical facilities, the OB will contain over 100 housing, administration, recreational, and service facilities to support the full-time assigned personnel.

The DAA facilities are designed to support missile, canister, launch, and transporter assembly, to house intermediate-level maintenance, and to provide weapon system storage. The principal facilities of the DAA are the missile assembly buildings (MABs), a munitions facility, and other support areas. Two MABs are planned; one for deployment assembly and the other for maintenance. The MABs consist of a high-bay assembly area, a low-bay storage and receiving area, an attached two-story support area and an outside solid-stage loading pad. The munitions facility is a secure area that stores and provides working areas for processing and assembly of the reentry system and components. The support areas are general storage, service, maintenance, and administrative areas.

The OBTS is a system test facility located in the proximity of the DAA. Its purpose is to: support subsystem and system development tests, processing, integration, and weapon system tests which require facilities located in a geological and climatological respresentative area; support follow-on test and evaluation efforts; perform technical data validation and verification; perform human factors/maintainability tests and evaluations, and support certain training activities. The OBTS will consist of the following facilities: a test-support building which houses test unique equipment; an ASC with a CMF that will be similar to the ones deployed in the operational area and physical security system (PSS) facilities also similar to operational; three PSs with ROSEE as similar to the operational version as is technically possible; cluster roads; primary/secondary access roads; RSS; and data link between the RSS and the PSS facilities.

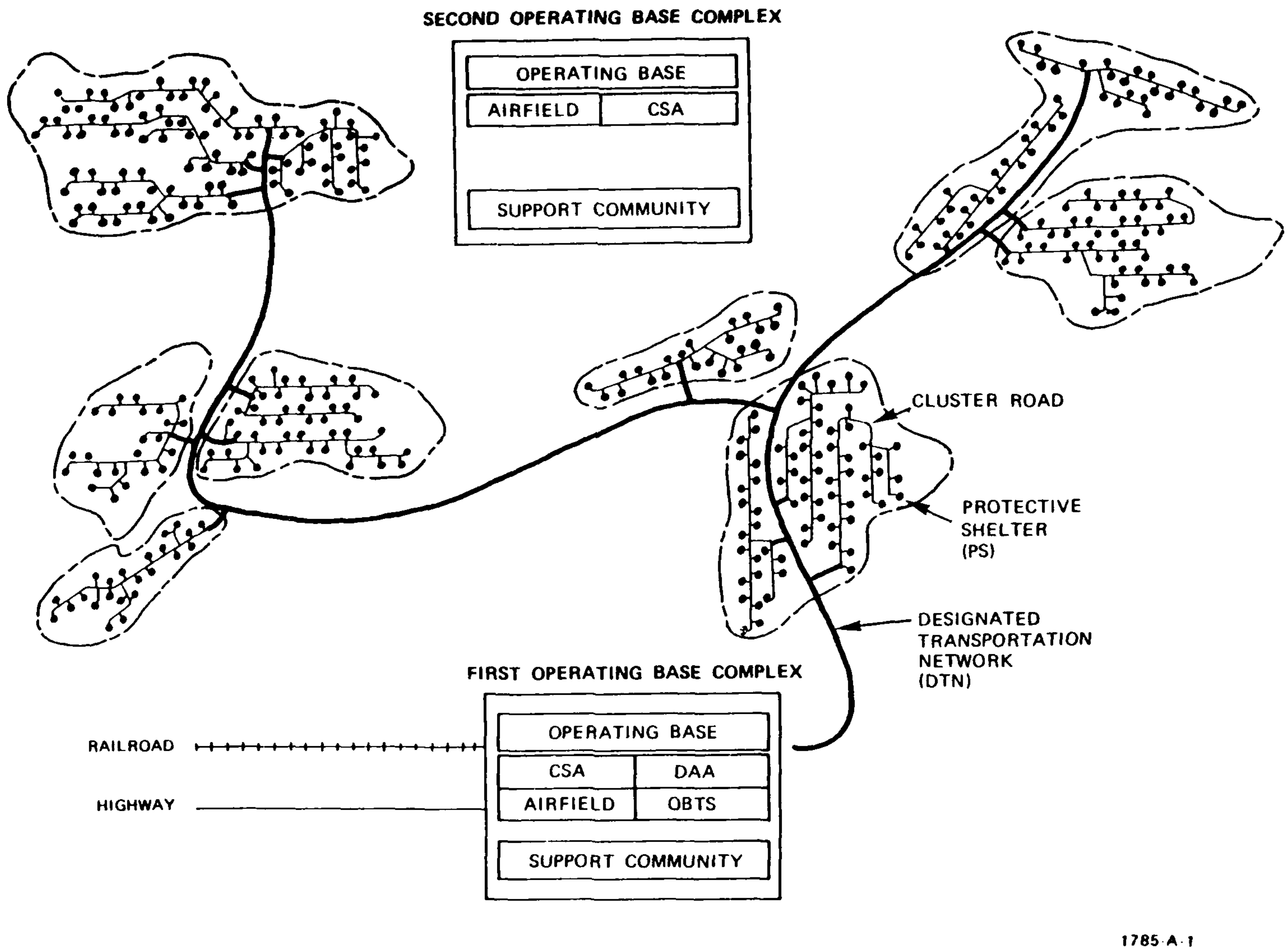


Figure 3.0-1. Schematic of M-X system facilities.

3.2 PROTECTIVE SHELTERS

Figures 3.2-1 and 3.2-2 show the latest shelter design. The PS is a reinforced concrete tube 171 feet - 3 inches long with an inside diameter of 14 feet - 6 inches and a wall thickness of 1 foot - 9 inches. The inside of the tube has a steel liner 3/8 inches thick. The closure is also made of reinforced concrete with steel liner. Figure 3.2-3 shows the closure in detail.

The two monitoring ports shown in plan in Figure 3.2-1 are 10 feet 6 inches long in the direction of the longitudinal axis of the shelter. The width of the ports is determined by projecting a 90 degree view angle 45 degrees either side of the vertical, perpendicular to the centerline of the tube.

The PS is buried under 5 feet of earth. This earthen berm is retained by a sheet piling headwall at the closure end of the PS.

3.3 ROAD SYSTEMS

The three types of roads that support the M-X system are the designated transportation network (DTN), the cluster roads, and the support roads.

DESIGNATED TRANSPORTATION NETWORK (DTN) (3.3.1)

The DTN serves to connect the OB complex to the DDA for the primary purpose of allowing transportation of the missile/canisters via the road special transport vehicle (RSTV) to the clusters. The DTN stops at the cluster side of the barrier, specifically at the stock fence line.

As presently designed, the DTN is a 24-foot wide road with 5-foot shoulders on either side. It has a 6-inch asphalt surface on a 10-inch aggregate base. Figure 3.3.1-1 is a typical section for the DTN. The DTN has a maximum profile grade of 7 percent and a minimum horizontal radius of curvature of 500 feet.

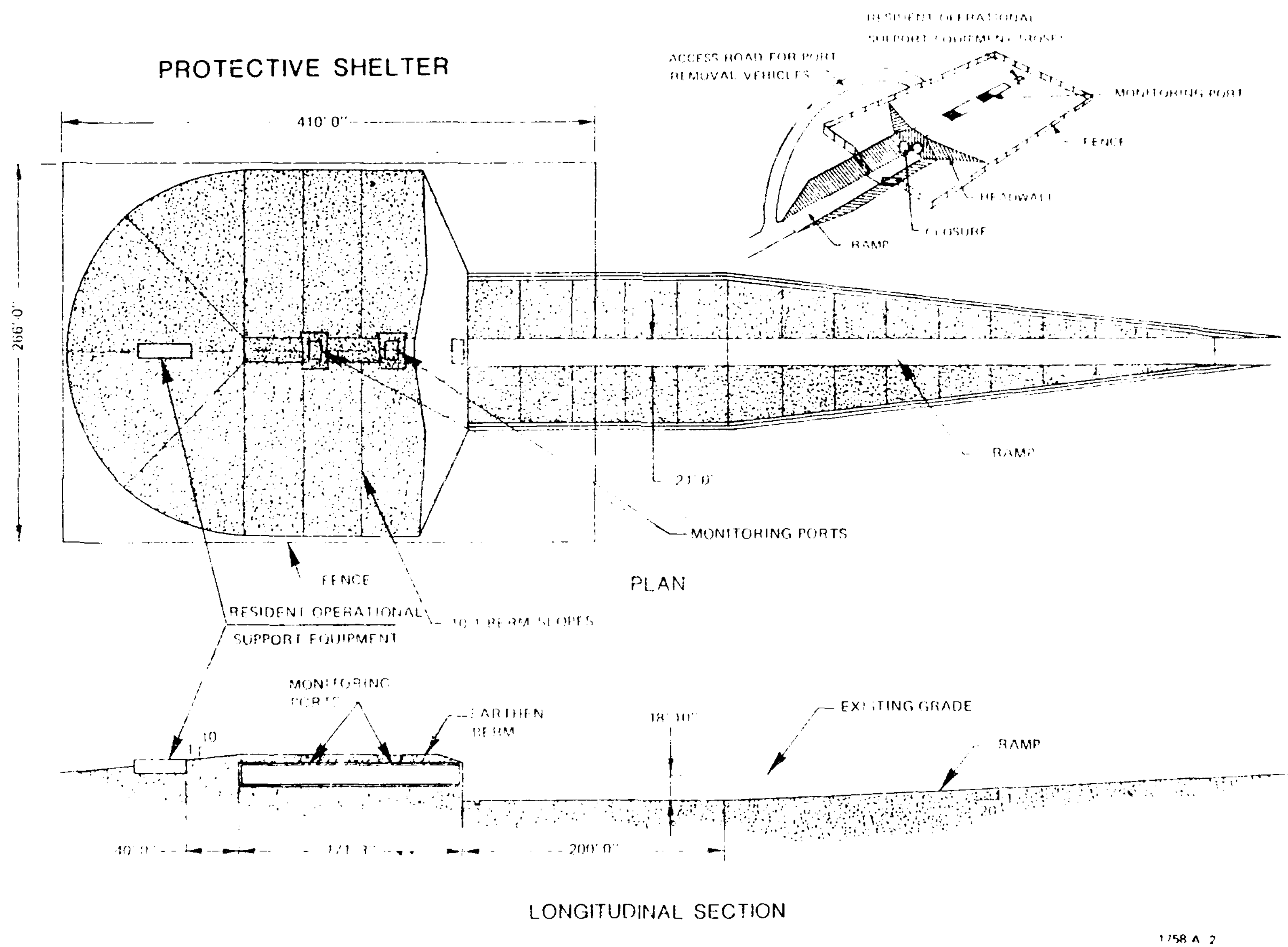
CLUSTER ROADS (3.3.2)

The cluster road joins the DTN at the barrier and connects the DTN to the cluster. The cluster roads allow the RSTV to proceed from the barrier area to the cluster maintenance facility (CMF) and allow the transporter to proceed from the CMF to the protective shelters in the cluster. The cluster roads include those roads which pass by all 23 shelters and those roads which spur off the main cluster road to each shelter.

The cluster road used for the DEIS is a 27-foot wide road with 5-foot shoulders on either side. It has an aggregate surface depth of either 10 inches or 19 inches, depending upon the type of subgrade it is placed on. Figure 3.3.2-1 is a typical section for cluster roads. The cluster roads, like the DTN, have a maximum profile grade of 10 percent and a minimum horizontal radius of curvature of 500 ft.

SUPPORT ROADS (3.3.3)

The support roads are of three types: access, intercluster, and SALT monitoring port (SMP) roads. The access support roads connect the DTN or the



Source: R. M. Parsons Co., June 1980

Figure 3.2-1. Protective shelter configuration, plan and longitudinal section.

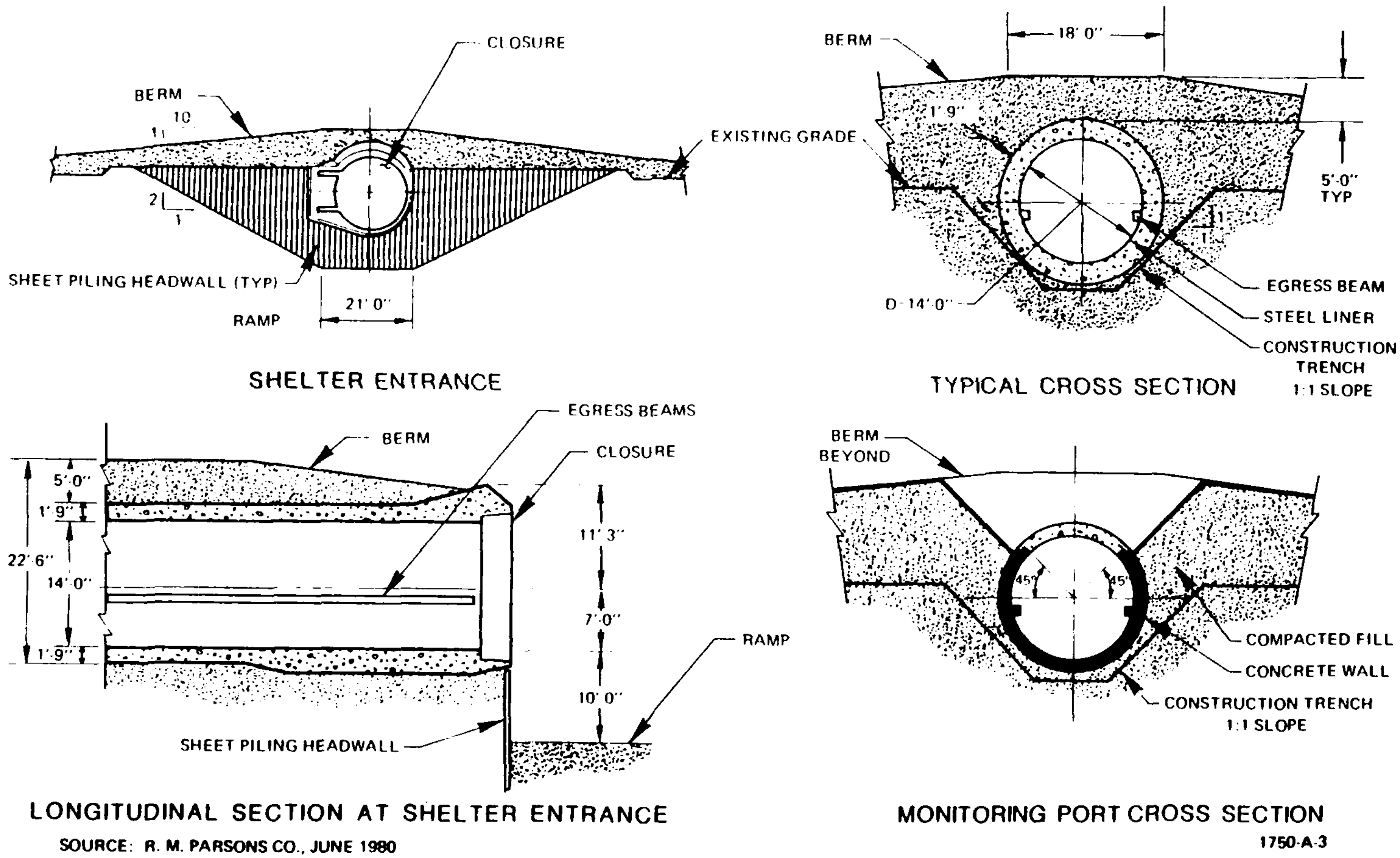


Figure 3.2-2. Protective shelter configuration, cross sections.

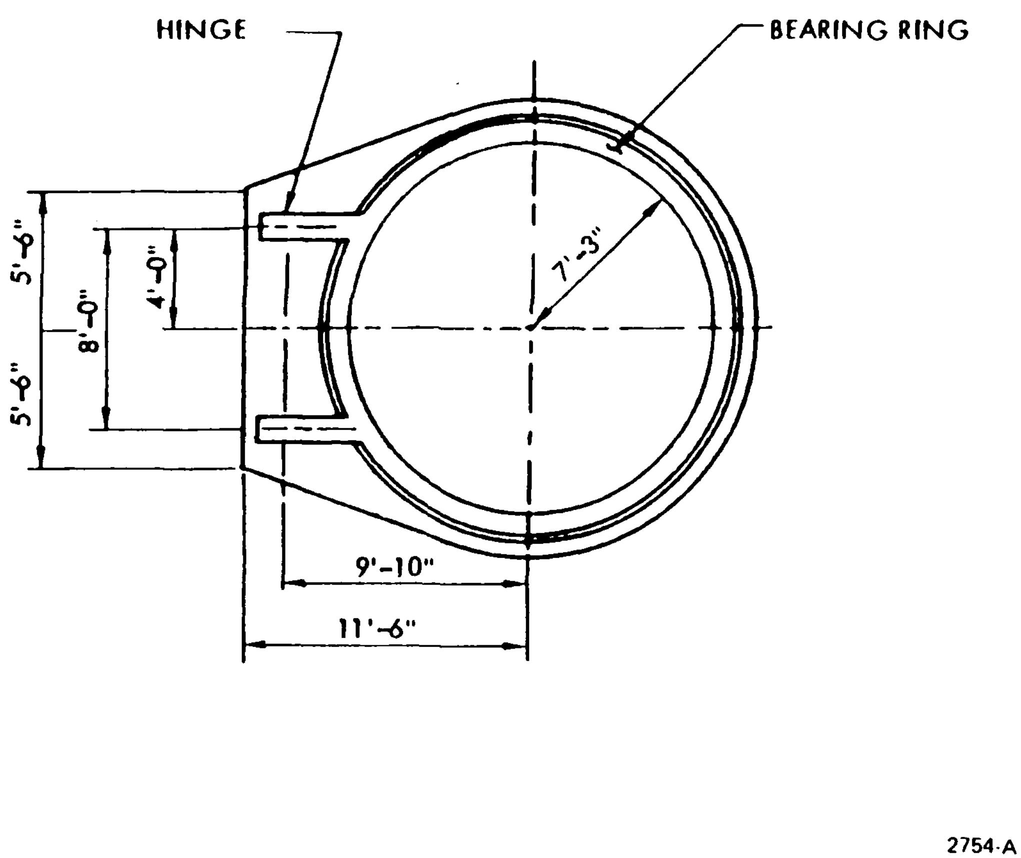


Figure 3.2-3. Protective shelter closure.

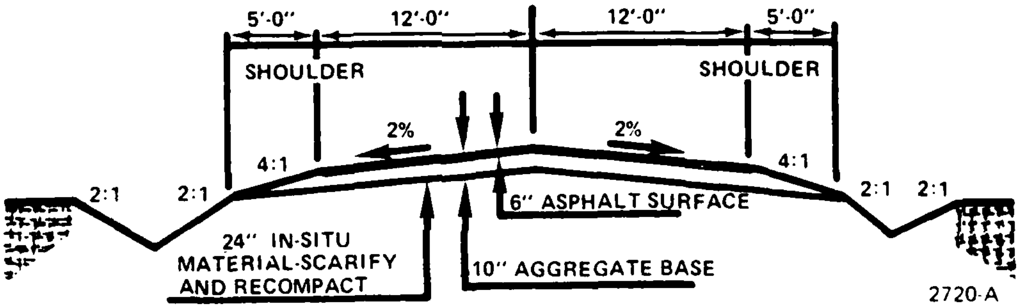


Figure 3.3.1-1. DTN typical section.

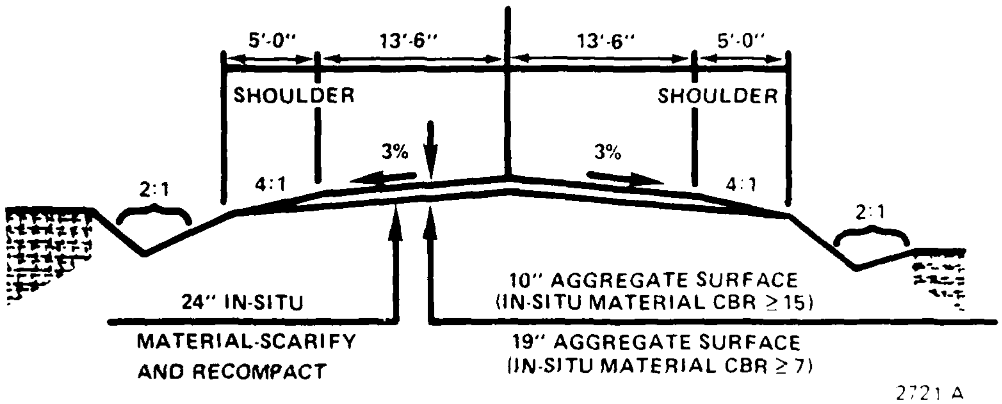


Figure 3.3.2-1. Cluster roads typical section.

cluster roads to support facilities such as the CMF, the remote surveillance site (RSS), the area support center (ASC), and the power distribution centers. The intercluster support roads connect adjacent clusters with roads over which the transporter or RSTV cannot pass. The SMP support roads permit access from the cluster roads to the top of the shelters to support SMP covers removal/replacement operations.

The support road is a 10-foot wide road with a 5-foot shoulder on either side. The access support road and the intercluster support road have a 6-inch thick aggregate surface. The SMP support road is a graded earth road. Figure 3.3.3-1 is a typical section for support roads. The access and intercluster support roads have a maximum profile grade of 10 percent while the SMP support roads have a maximum profile grade of 20 percent. All three types of support roads have a minimum horizontal radius of curvature of 100 feet.

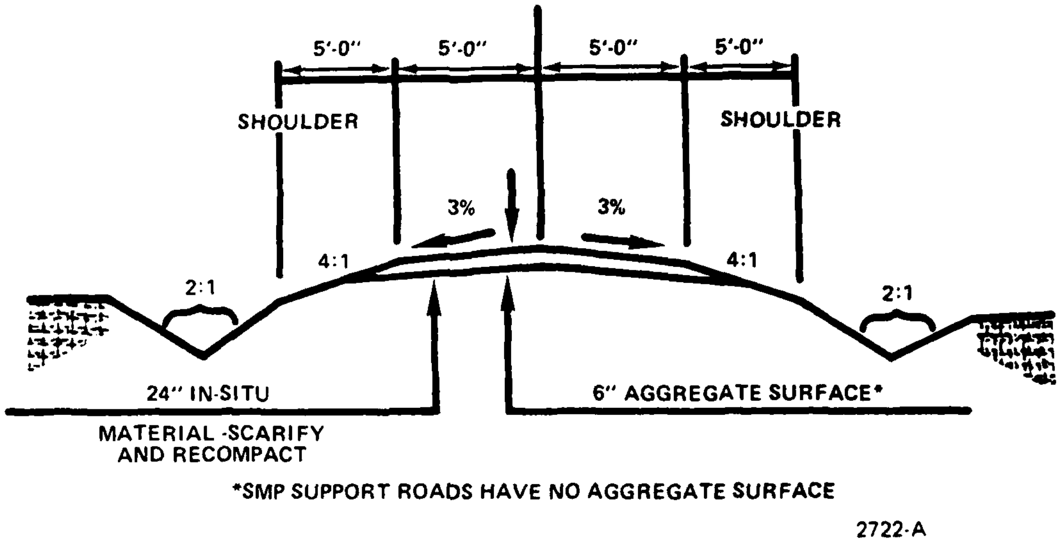


Figure 3.3.3-1. Support roads typical section.

4.0 CONSTRUCTION PLANNING

The construction plan determines the temporal and spacial sequence in which individual project facilities are constructed. The schedule for construction of the two operating base complexes is reasonably well established as is the overall schedule for DDA construction, but the detailed scheduling of the individual segments of the DDA is not established except for the IOC cluster which must be completed first. Two construction planning approaches are being considered. One is referred to as the sequential method and the other as the concurrent method.

For each method, the system is divided into several construction groups (18 in the Proposed Action). The initial group contains the first operating base complex and the clusters designated for initial operational capability (IOC). The differences in the order of construction of the following groups characterize the major differences between the sequential and concurrent methods. (Refer to Appendix 6 for Army Corps Engineers Alternative Conceptual Construction Plans). The environmental and socioeconomic effects of either method are a result of the intensities of the construction activities within each specific region, and not necessarily from the total amount of activity required to construct the entire system, which is the same for both methods. Since the total construction time allowed for completion of the project does not change with either method, the intensity of the construction activities in a region characterizes the differences between the methods. This is because the number of regions that have construction activities occurring simultaneously and the intensity of activity within them is different for the sequential method than for the concurrent method.

4.1 SEQUENTIAL METHOD

The sequential method begins by constructing the first operating base complex and the IOC clusters and then progresses outward. Figure 4.1-1 is a schematic diagram of this method. Generally a large work force is concentrated in a relatively small area (group #1 in the diagram) until work is completed in that group and then moves to the next adjacent group (group #2 in the diagram). A small amount of construction activity overlaps between groups during the move from one group to the next. The work within each group begins with the designated transportation network (DTN) followed by the cluster roads, and ends with the protective shelters and other facilities.

The sequential method has several advantages from an operations point of view. Completing adjacent clusters sequentially, starting from the operating base complex, allows missiles within the same geographical areas to be deployed at approximately the same time. Fewer security and operations personnel are needed since the missiles are located in the same general area. All the utilities within the DTN right-of-way, particularly the C^3 system, are connected as they are completed, to the operating base complex.

The operational advantages could be offset by some adverse environmental and socioeconomic effects. Large numbers of construction personnel are concentrated in relatively small areas for a short period of time thus intensifying the impacts rather than spreading them out over a larger area.

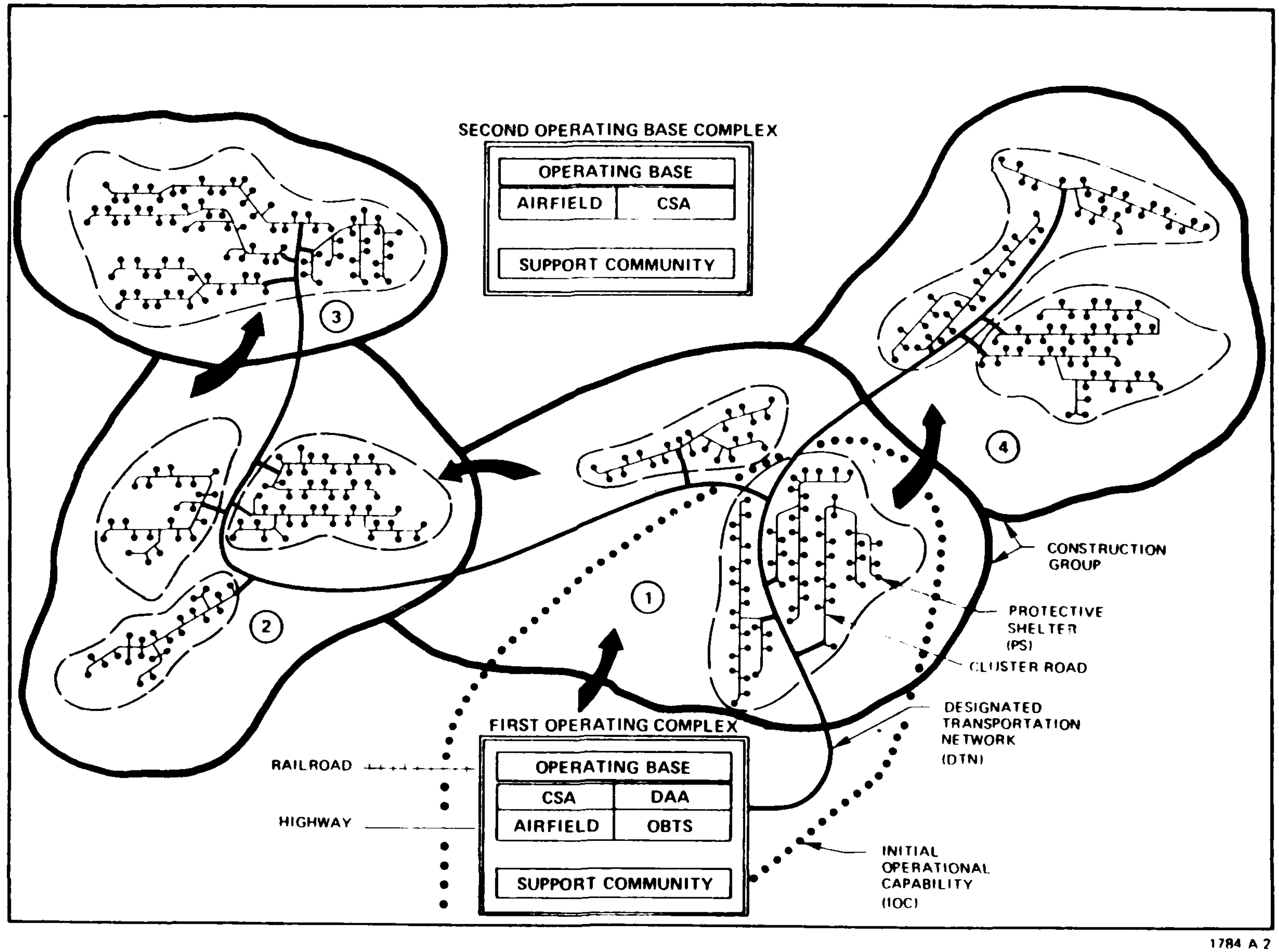


Figure 4.1-1. Schematic of M-X facilities development, sequential.

4.2 CONCURRENT METHOD

As is the case with the sequential method, the concurrent method also begins by constructing the first operating base complex and the IOC clusters. However, shortly after construction starts in the IOC clusters, additional construction activities start in other groups in other regions remote from the initial group. This is shown schematically in Figure 4.2-1. (In the diagram all four groups would be constructed at the same time.) The order of construction within a group is the same as the sequential method: that is DTN, then cluster roads, and then protective shelters.

The major advantage of the concurrent method is that the workforce is spread out over several regions which tends to mitigate some of the adverse environmental and socioeconomic impacts associated with the concentrated activity as characterized by the sequential method. The demands for other resources, such as water and electrical energy, are also dispersed over a large area.

The disadvantages of the concurrent method are generally operations oriented. Since completed clusters are not always contiguous, larger security and operations personnel are required. Additionally, it would be necessary to construct the DTN and communications facilities to all groups early in the construction schedule.

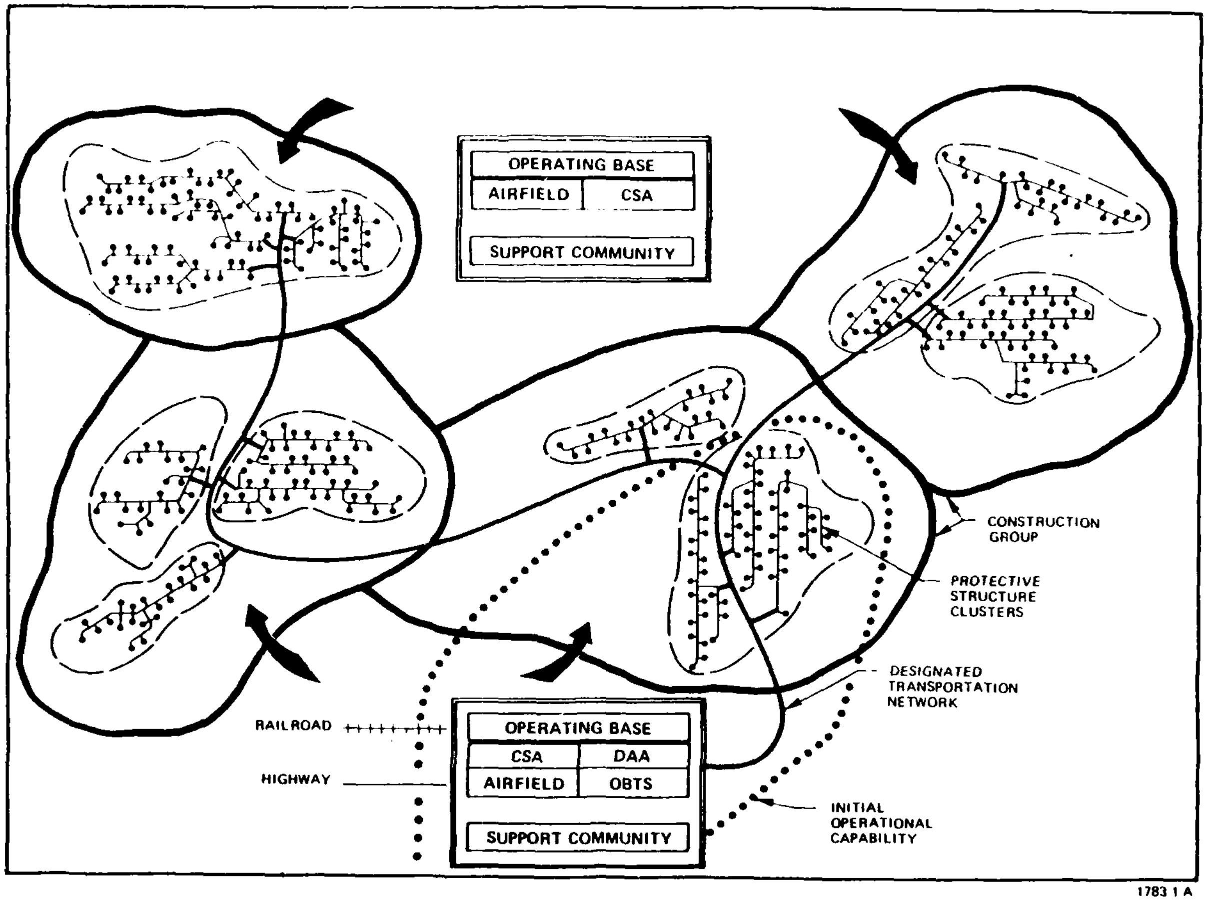


Figure 4.2-1. Schematic of M-X facilities development, concurrent.

5.0 CONSTRUCTION TASKS

5.1 MOBILIZATION

Mobilization involves the assembly of personnel, equipment, materials, and support facilities required to construct the M-X system. Included in this activity is the development of the following items:

- o Water wells
- o Aggregate sources
- o Marshalling yards
- o Construction camps
- o Temporary power

WATER WELLS (5.1.1)

Water wells will be developed approximately every 30 mi along the designated transportation network (DTN), at the construction camps and/or concrete plants, and at each cluster. Whenever possible, these wells will be made a part of the permanent water system required for the operation of the M-X system. When the wells are temporary and only required for construction uses, temporary portable distribution and storage facilities will be used. These facilities will be relocated as construction progresses. During construction, the wells will supply domestic and construction requirements. After construction is completed, the major demand will be for domestic use at the operating base complexes.

AGGREGATE SOURCES (5.1.2)

Two types of aggregate sources are required for the project--sand and gravel deposits, and minable rock formations. These sources may or may not be located within the project area. The methods of obtaining the aggregate will be the same whether the sources are located within the project area or not, the only difference being the haul distances required to deliver the aggregate to the manufacturing plants.

Aggregate pits will be used to provide sand and gravel for construction and will be located based upon the latest geotechnical data available. At each location, mining, washing, stockpiling, and loading operations are required to provide material for the production of concrete, railroad ballast, road base and surface courses, and asphalt paving.

When sand and gravel are deficient in size or a higher grade of material is required, quarrying operations will be necessary to provide suitable rock for the manufacturing of additional aggregate.

Aggregate manufacturing plants are used to process quarried rock. This processing includes crushing, washing, sizing, and sorting. Material sizes produced vary from coarse to sand-size aggregate.

During plant operations, the aggregate is washed to remove deleterious materials and the fines produced during crushing. This wash water flows to settling ponds where these materials are removed and the water recirculated through the plant.

Equipment requirements for an aggregate manufacturing plant vary greatly according to the number of different gradations (sizes) of aggregate required. Figure 5.1.2-1 is a diagram of a typical aggregate manufacturing plant that produces sand, aggregate that can be used as a road base or surface, aggregate that can be used in asphalt paving, and aggregate that can be used in concrete. It is estimated that an aggregate manufacturing plant will require an area of five acres for operations.

MARSHALLING YARDS (5.1.3)

Marshalling yards will be developed near the perimeter of the deployment area acting as the receiving and storing sites for equipment and materials. Two main requirements for a marshalling yard are railroad and highway access. Marshalling yards will probably be set up near the operating base locations. Additional marshalling yards are desirable in other regions remote from the operating bases since this will cut down on the haul distances from the yards to construction sites.

Equipment and materials will be received at the marshalling yards and will be inventoried, labeled and put into temporary storage. When needed, the equipment or materials will be trucked to the construction sites. Equipment and materials should be handled a minimum number of times to ensure economy of construction. However, additional storage will be required at the concrete plants and the steel fabrication and assembly areas.

Since most of the materials needed for construction are stored at the marshalling yards at one time or another, it is anticipated that a marshalling yard will require about 650 acres for receiving and storing.

CONSTRUCTION CAMPS (5.1.4)

The construction sites generally will be too remote for workers to locate their families in nearby communities and commute to work on a daily basis, although there will be situations where this is possible. Therefore, temporary construction camps will be established to support the workforce. These camps would not provide housing for worker families or other indirect personnel. Construction workers would either leave their families where they are, or would move them to some community within weekend commuting distance of the construction sites, if possible.

Construction camps would consist of the following temporary facilities: dormitory and lavatories, mess hall and kitchen, recreation building, theater, infirmary, and maintenance shop. Central management offices and a heavy vehicle maintenance yard would be adjacent to the camp, as would be the truck head for receipt of incoming material. All of these personnel facilities would be serviced by a portable sewage disposal plant. The major production facilities would include water wells, a sand and aggregate plant, settling ponds and possibly a concrete plant. Figure 5.1.4-1 presents a conceptual layout of the construction camp and production facilities.

The initial construction camp will be established at the first operating base location. This camp will house the personnel that will construct both the first operating base complex and the initial portion of the designated transportation network (DTN). The first workers will live in self-contained trailer-type units with

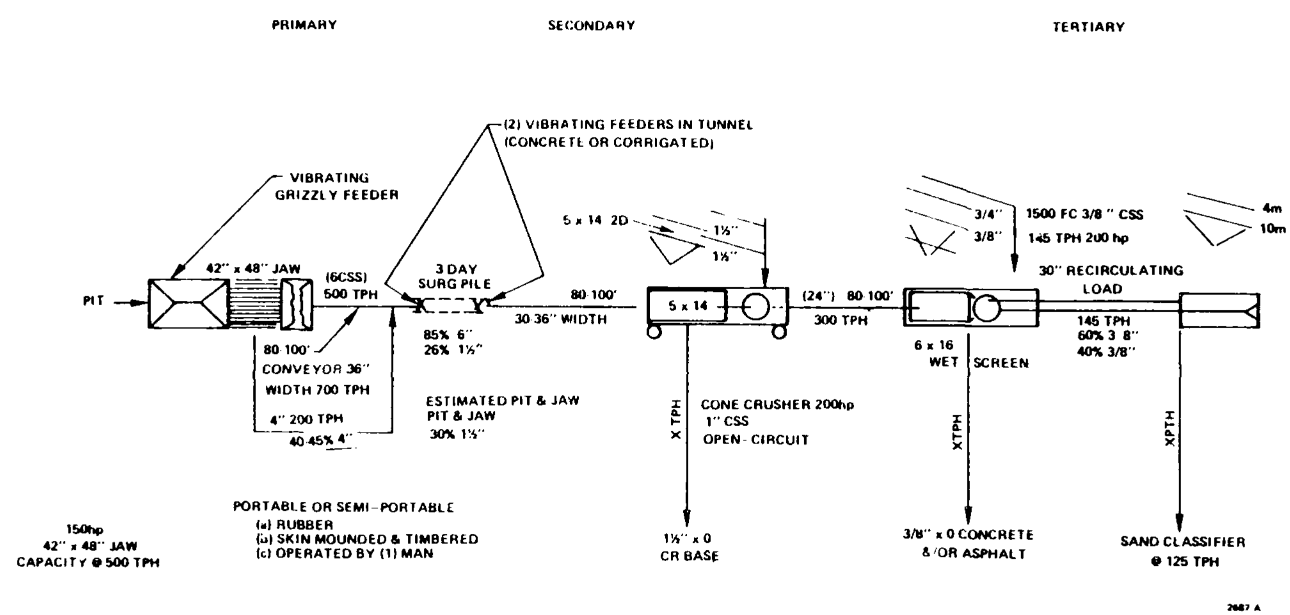


Figure 5.1.2-1. Aggregate manufacturing plant.

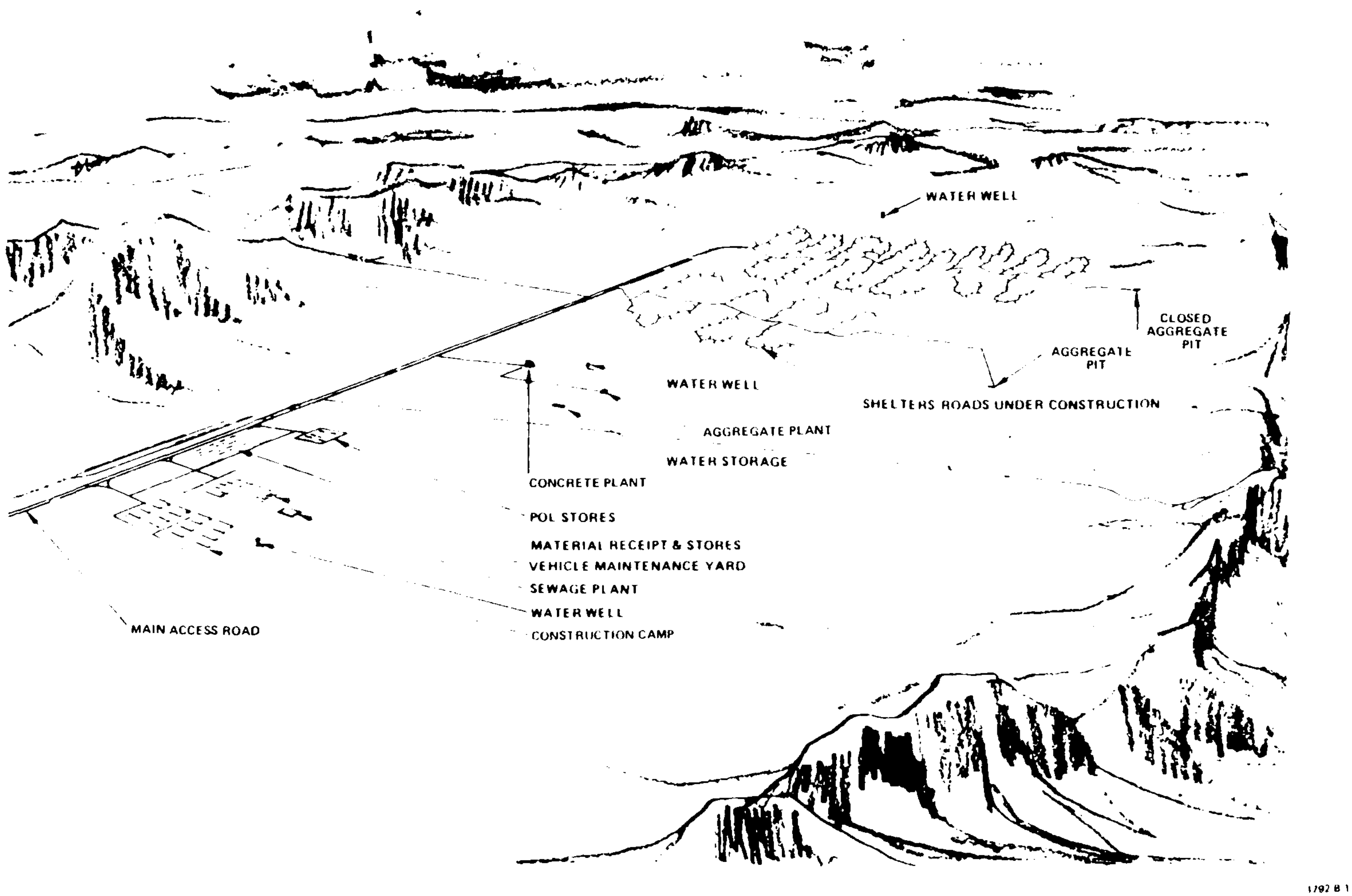


Figure 5.1.4-1. Construction camp facilities.

their own water supply, cooling, and sewage disposal. Some of the workers may have to live offsite and commute to work by bus or automobiles. This initial construction camp, with modifications, will be a permanent facility. This camp will have to support approximately 2,500 people during the peak year for construction.

The second construction camp will be established in the initial construction area in the designated deployment area (DDA) soon after the first camp. It will support DTN construction and the development of water wells and aggregate sources. As the construction expands, the erection of concrete plants and the development of material storage areas will be required to support the construction of the cluster roads, protective shelters, and other DDA facilities. Some of the facilities in the construction camp could become permanent if the camp is located where an area support center (ASC) will be. The remaining facilities will be relocated to another area.

The number of construction camps varies with the siting alternative. Generally there will probably be up to 18 total camps required with a maximum of about 3,500 people at a given camp during the peak period of construction. It is estimated that about 25 acres will be needed for each camp.

TEMPORARY POWER (5.1.5)

Temporary power for construction will probably be provided by diesel-powered generators, since most of the existing utility distribution systems are either not adequate to provide for the construction demands or do not have powerlines near the camps. As construction progresses on both the M-X system and proposed local power projects, permanent power facilities will be added and could be a source for power in construction areas.

5.2 OPERATING BASE COMPLEX CONSTRUCTION

There are two operating base (OB) complexes required for the M-X system. These are referred to as the first OB and the second OB. Associated with the OB complexes are a designated assembly area (DAA) and an operational base test site (OBTS). The first OB complex always includes a DAA and an OBTS. The second OB complex includes a DAA only when the siting alternative is a split based system but it never includes an OBTS.

The structures in the operating base complexes are expected to fall into four different categories: buildings with concrete walls and floors, buildings with concrete block walls and concrete floors, steel structures, and housing structures of wood and stucco. Before any buildings can be constructed, the roads and utilities, including water and power, must be available at the site. A rail spur must also be available. The contractor support area (CSA) will have to be partially completed, and temporary housing set up. Large supplies of basis building materials will have to be brought in by rail or truck, including crushed stone, cement, sand, wood, and plywood, some of which will have to be stored in suitable buildings. Water will have to be available for concrete, dust control, and general construction.

It is anticipated that normal building construction methods will be used in the OB complexes. An exception could be in the construction of the protective shelters at the OBTS. Discussion of the construction methods for protective shelters can be found in Section 5.4.

5.3 ROAD CONSTRUCTION

There are three types of roads required for operation of the M-X system. These are the designated transportation network (DTN), the cluster roads, and the support roads. The length of each of these types of roads varies with the siting alternative and is discussed in Section 5 of this report. The different roadway widths and structural sections required for each type of road have not been finally determined. Further discussion on this subject can be found in Section 3.3 of this report.

The DTN connects the operating base complexes to the clusters, terminating at the barrier for each cluster. As presently conceived, it will have an asphalt surface on top of an aggregate base. The cluster roads connect each cluster to the DTN at the barrier and each protective shelter within the cluster. These roads are designed with an aggregate surface. The support roads provide access around the cluster barrier, provide access to the protective shelter for removal of the monitoring ports, and, whenever possible, provide intercluster access. The support roads have an earth surface. Figure 5.3-1 shows the layout for these roads.

Road construction is a process whereby a strip of land is improved to provide a driveable surface for access. The major operations in the construction are: surveying, clearing and grubbing, grading, drainage, scarifying and recompacting, aggregate base or surface, fine grading, and asphalt concrete surface (DTN only).

The first step in road construction is to have a surveying team go to the designated road corridor and survey, or lay out, the physical location of the road on the ground. After the alignment for the proposed road is identified, the strip of land is cleared and grubbed. Clearing and grubbing is an operation performed to remove all vegetation, boulders, debris, etc., from the proposed road corridor.

Once the corridor is cleared, earth-moving equipment is brought in to perform the rough grading operation. Grading is done to reshape the existing terrain into the roadway cross section along the proposed alignment to the approximate vertical profile. The roadway is designed, to the maximum extent possible, such that all excavated material will be used in the embankments so that no material will have to be wasted, or borrowed from areas outside of the roadway corridor. As the roadway is brought to the proposed vertical profile, the embankment is compacted to a density greater than the naturally existing soil, to create a solid foundation for the proposed road. To get the required density, moisture is added to the soil to form a compressible mixture that can be compacted in layers by tractors pulling heavy rollers and tampers. In areas where the roadway is excavated from existing ground, the underlying material is scarified (loosened by a plowing operation) and recompacted to the necessary density.

While rough grading is in progress, drainage structures are constructed at locations specified in the design. Drainage structures are located to accommodate both existing drainage ways that cross the road alignment, and runoff carried by the ditches along the roadway. Each drainage structure is analyzed and designed to function properly with the hydrology and hydraulics of the basin through which the roadway passes.

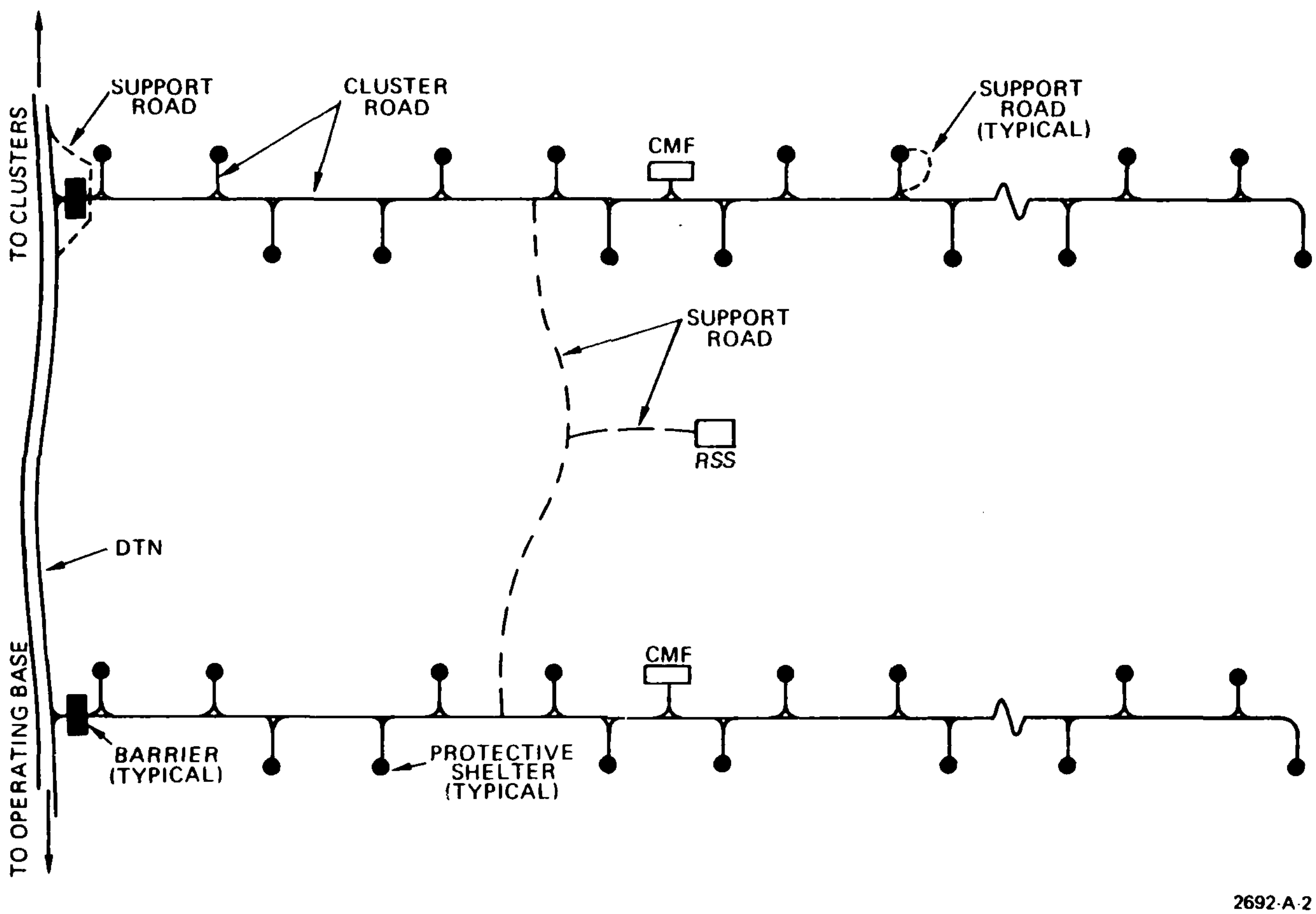


Figure 5.3-1. M-X system roads layout.

The roadway is now fine-graded to the more exact dimensions required for the final roadway cross section. The travel way is crowned, the shoulders shaped and the ditches are smoothed to drain efficiently.

After the roadway has been fine-graded, the final pavement structure is constructed for the cluster roads and the DTN. The pavement structure in the case of cluster roads will consist of a dense layer of aggregate. DTN roads will be comprised of a similar layer of aggregate with an asphalt surface course.

The appropriate traffic control and informational signs, and pavement markings (stripes, etc.) are installed to complete the road. As a final operation, the seeding and revegetation of disturbed roadway embankments and ditches is being considered.

The fundamental procedure for road construction described above typically uses conventional equipment (tractors, dozers, scrapers, etc.), performing each task as a separate operation. Also under consideration for the M-X roads system, is an automated road builder (see Figure 5.3-2) capable of finish grading, stabilizing, and compacting a 24-ft wide road section in one pass, at speeds up to 180 ft per minute.

5.4 PROTECTIVE SHELTER CONSTRUCTION

The protective shelter is a steel-lined, reinforced concrete tube approximately 171 feet long with an inside diameter of about 14 ft and an outside diameter of about 18 feet (see Figures 3.2-1 and 3.2-2). Since there are 4,600 identical protective shelters required for the system, there are several methods of construction possible. The methods presently being considered are precast, mechanized cast-in-place, and conventional cast-in-place. Since the precast and mechanized cast-in-place methods require the use of special equipment and techniques currently being developed, a test program will be conducted in 1981, to demonstrate their capabilities. The conventional cast-in-place method would use equipment and techniques that are commonly employed in concrete construction.

PRECAST METHOD (5.4.1)

Precast concrete construction is a method in which individual segments of the protective shelter are built at a centrally located plant, transported to the shelter sites, and assembled. The precast plant is set up near the construction camp and is portable, moving to several locations during the construction period. Aggregate sources and water wells are nearby. Storage areas for cement, steel, flyash, and other materials are adjacent to the plant. Figure 5.4.1-1 illustrates a representative precast concrete plant.

Precast plants produce all the concrete segments and closures necessary to complete the protective shelters. There are basically four different types of segments required. One type is the end segment with one end of the tube solid and the other end open. Another segment is the normal type, both ends open. The third type of segment is the same as the normal segment except that it has a SALT monitoring port. All three of these segments have a constant cross section. The final type is a transition segment which is the segment next to the closure. It is a transition segment because it transitions from the constant cross section type to the closure.

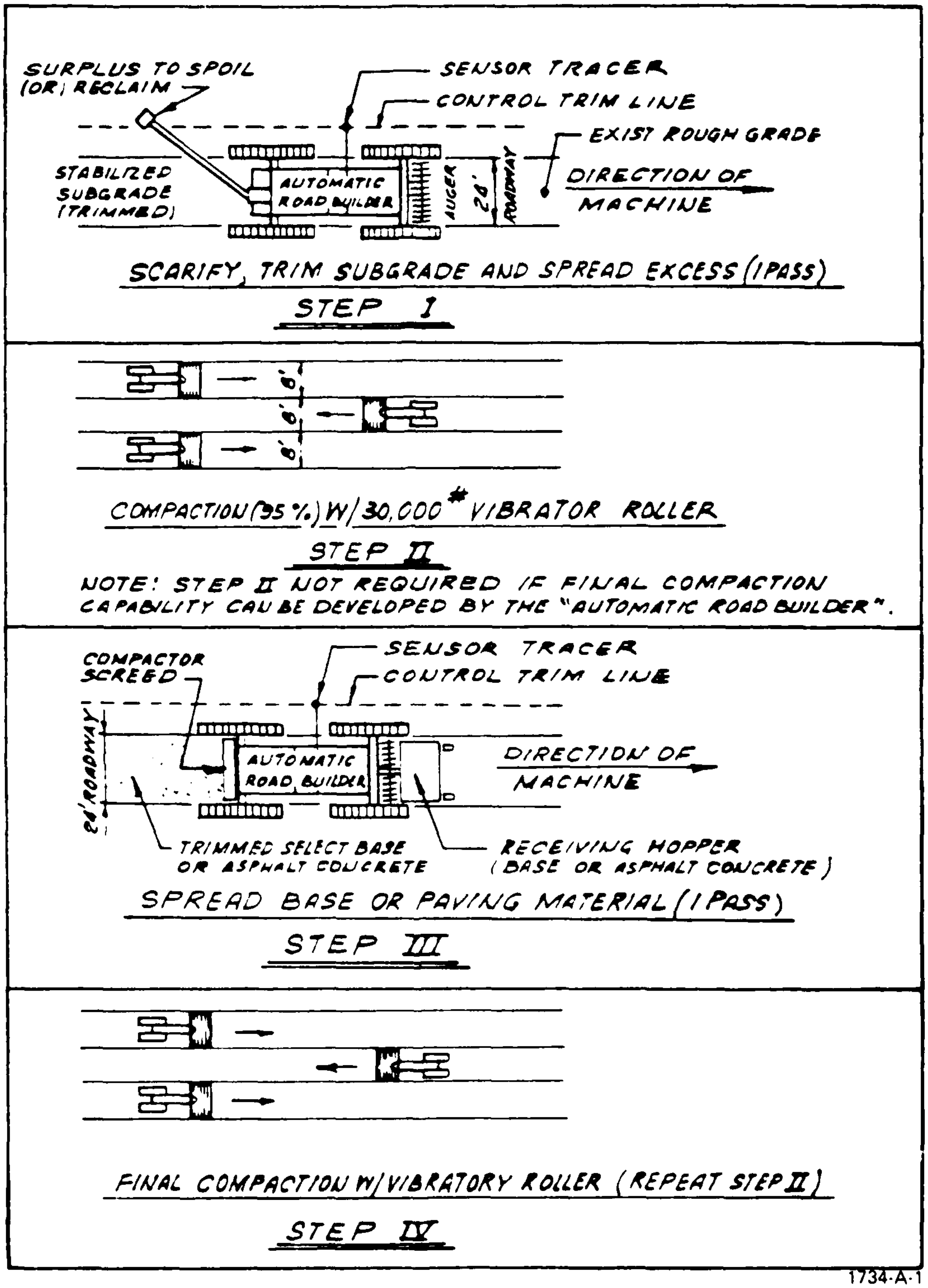


Figure 5.3-2. Automated road builder.

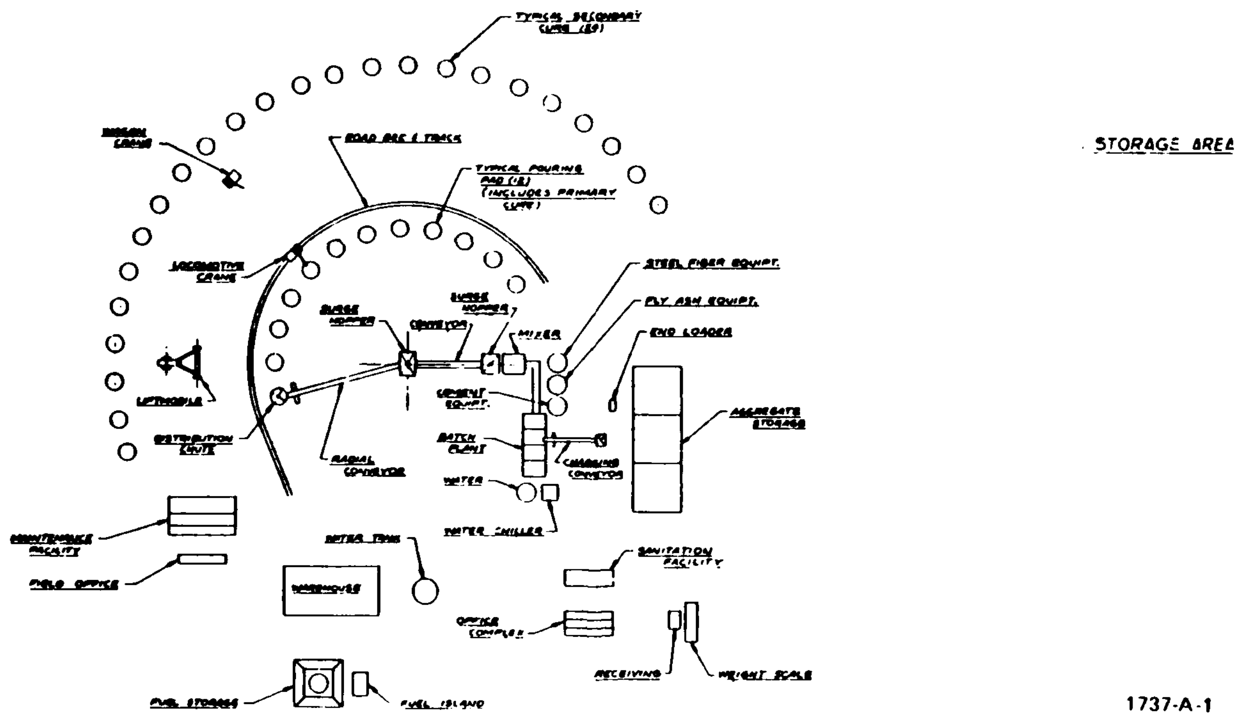


Figure 5.4.1-1. Precast concrete plant.

The major work items involved in the precast method are: excavating the trench and the ramp, pouring, transporting, and placing the precast sections; and backfilling the site.

Since many of the work items are repetitious and require the moving and/or placing of heavy articles or large quantities, the opportunity for developing specialized equipment is very real. In fact, there are many companies presently engaged in studying the possibility of using some of the special equipment discussed later on in this article.

Excavation (5.4.1.1)

Two methods of excavating the trench and the ramp for the protective shelter are open cut excavation and contour excavation. Open cut excavation can be used for part or all of the shelter trench and for all of the ramp. If the open cut method is used for only part of the trench, the remaining excavation is performed by the contour method.

Open cut excavation involves the use of a special machine which excavates a trapezoidal shaped section as shown in Figure 5.4.1.1-1. When this method is used for all the shelter trench excavation, the bottom of the trench is at the invert of the concrete shelter. Precast concrete pads, or cradles, are then placed in the trench (see Figure 5.4.1.1-2) and the precast shelter segments are set on these pads.

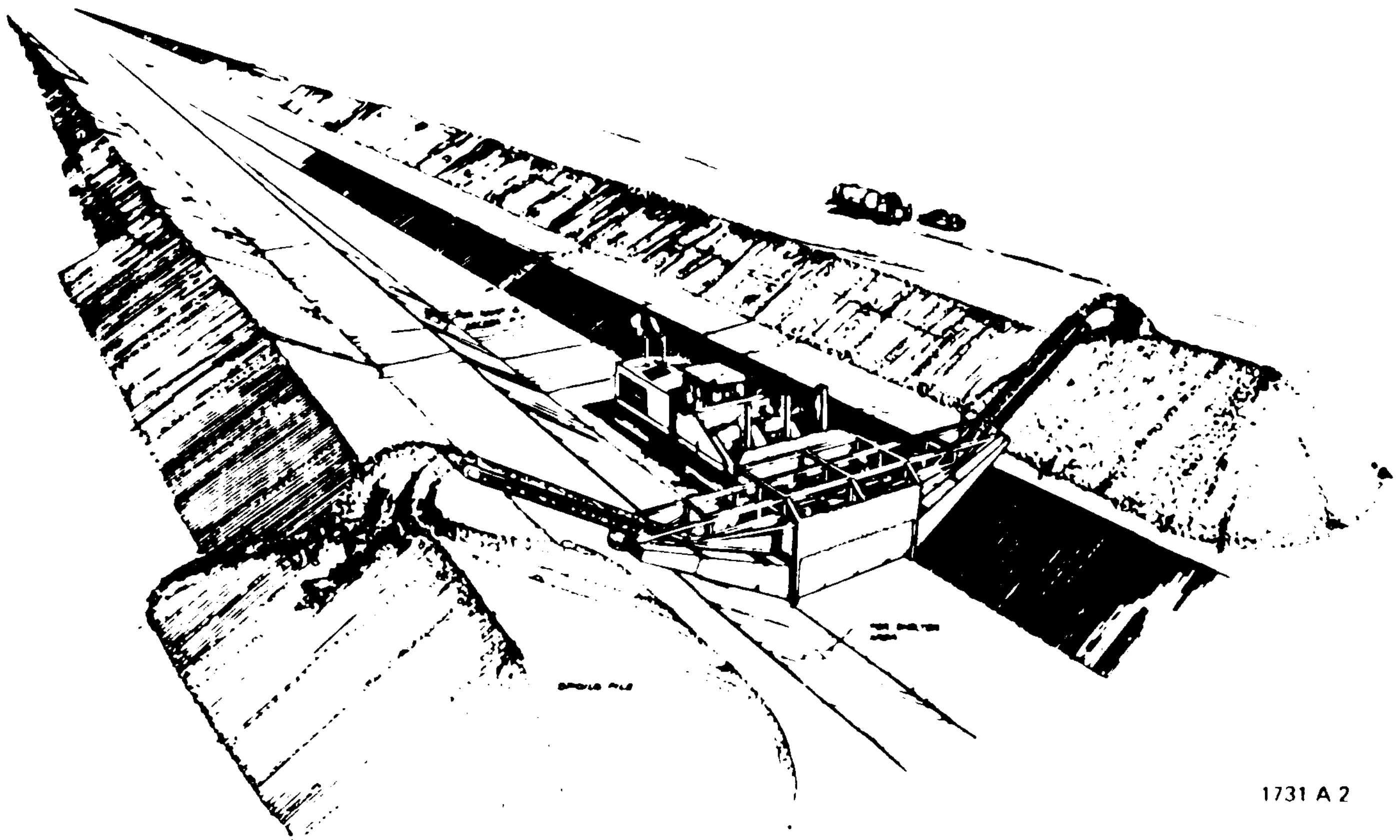
Contour excavation also uses a special machine. If the contour excavation method is used for the shelter trench, excavating down to the springline of the concrete shelter section would still be done by the open cut method. Then the contour excavating machine would cut a semicircular trench with a radius equal to the outside radius of the concrete shelter, as shown in Figure 5.4.1.1-3. The precast shelter segments are placed in the contoured trench, using the precast concrete pads as in the open cut excavation.

In both the open cut and contour methods of excavation, the excavated material is carried to the surface by conveyors, where it is stockpiled for use in the backfilling operation.

Precast Shelter Segments (5.4.1.2)

The precast method generally follows these procedures. First, cages of reinforcing steel and steel liners are assembled and moved to the casting area where forms are placed around the cages and concrete poured into the forms. After the concrete is vibrated to remove air pockets and to distribute the concrete evenly around the reinforcing steel, the concrete segment remains undisturbed until the concrete is hard enough for the forms to be removed. After removal of the forms, the shelter segments are stored until the concrete reaches its maximum strength and then transported to the protective shelter sites on special vehicles. Upon delivery to the site, the segments are placed in the previously excavated trench and mated to the abutting segment.

Several types of special equipment are necessary to manufacture, deliver, and place the precast protective shelter segments.



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SOURCE: R. M. PARSONS CO., JUNE 1980

Figure 5.4.1.1-1. Open cut excavation.

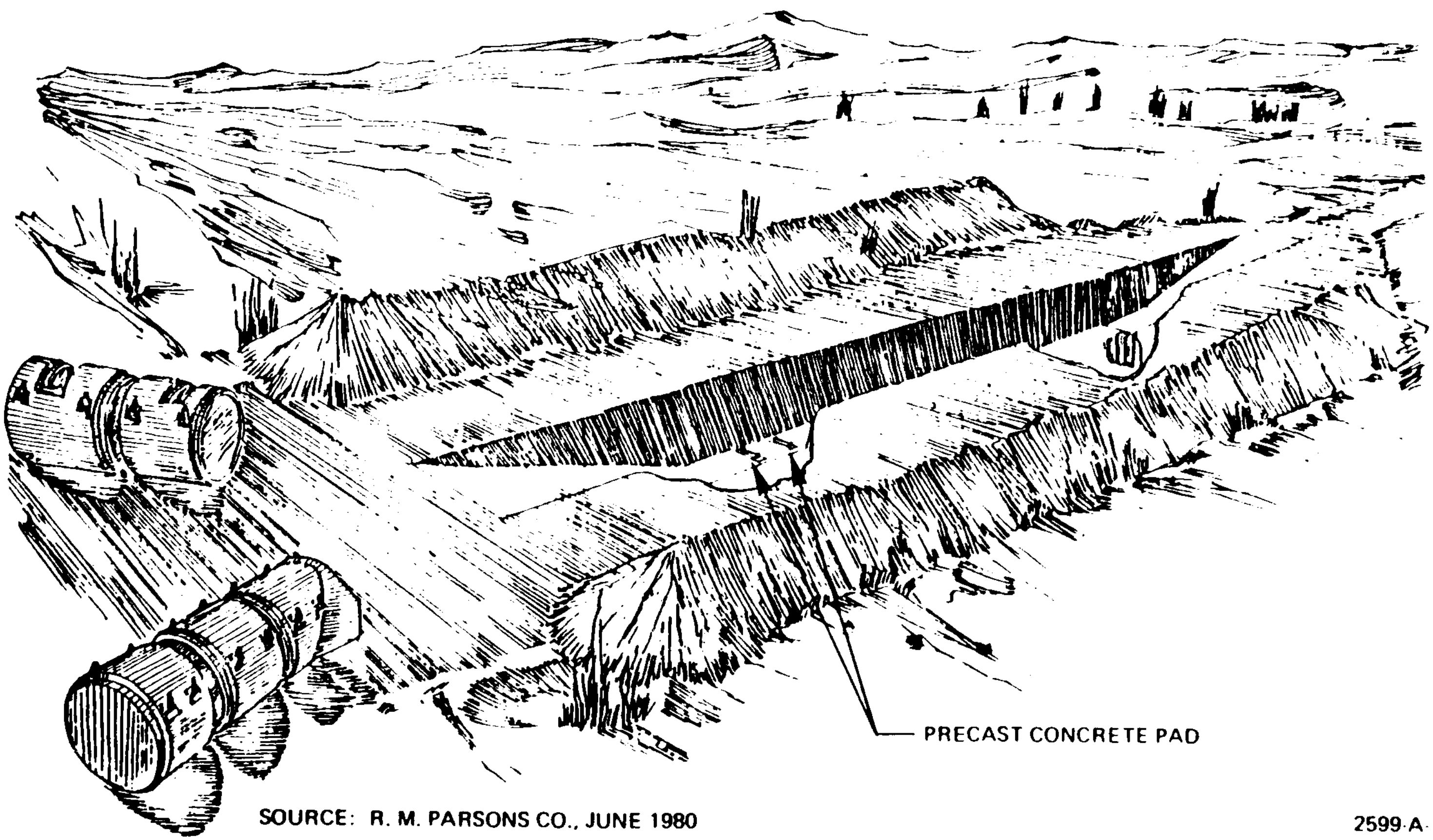

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Figure 5.4.1.1-2. Open cut excavation final excavation stage.

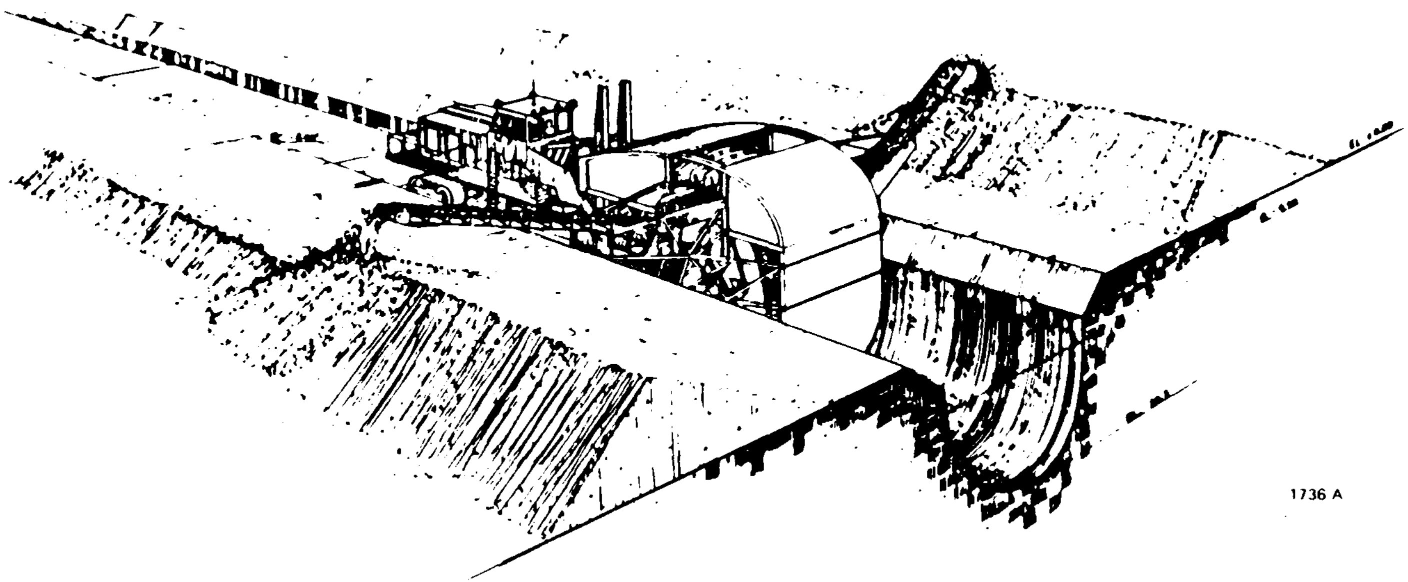


Figure 5.4.1.1-3. Contour excavation.

Special equipment capable of making the reinforcing steel/steel liner cages are needed. Figures 5.4.1.2-1 and 5.4.1.2-2 are conceptual drawings of what these facilities might be.

The precast protective shelter segments could weigh anywhere from 250 to 310 tons, depending upon the segment. In order to load/unload and transport these segments, special equipment is required. One piece of equipment that could load the shelter segments onto the transport vehicle at the precast plant and unload the segments at the shelter site is called a pipemobile or a liftmobile. Figures 5.4.1.2-3 and 5.4.1.2-4 are examples of this type of special equipment. The heavy weight of a precast segment also dictates the use of a special transport vehicle. Figure 5.4.1.2-5 is a drawing of what a tractor-powered transport vehicle might look like.

Once the precast segments have been unloaded at the shelter site, the next job is to place them in the trench. The piece of special equipment required to perform this is an installing jumbo. Figure 5.4.1.2-6 is a drawing representing what this machine would look like.

After the segments are in place the final items of work on the concrete shelter itself include grouting the segments together: welding together the steel liners inside each shelter segment, installing the egress beams and rails, completing the headwall, and installing the closure. Some of these work items could be performed with special machines or equipment.

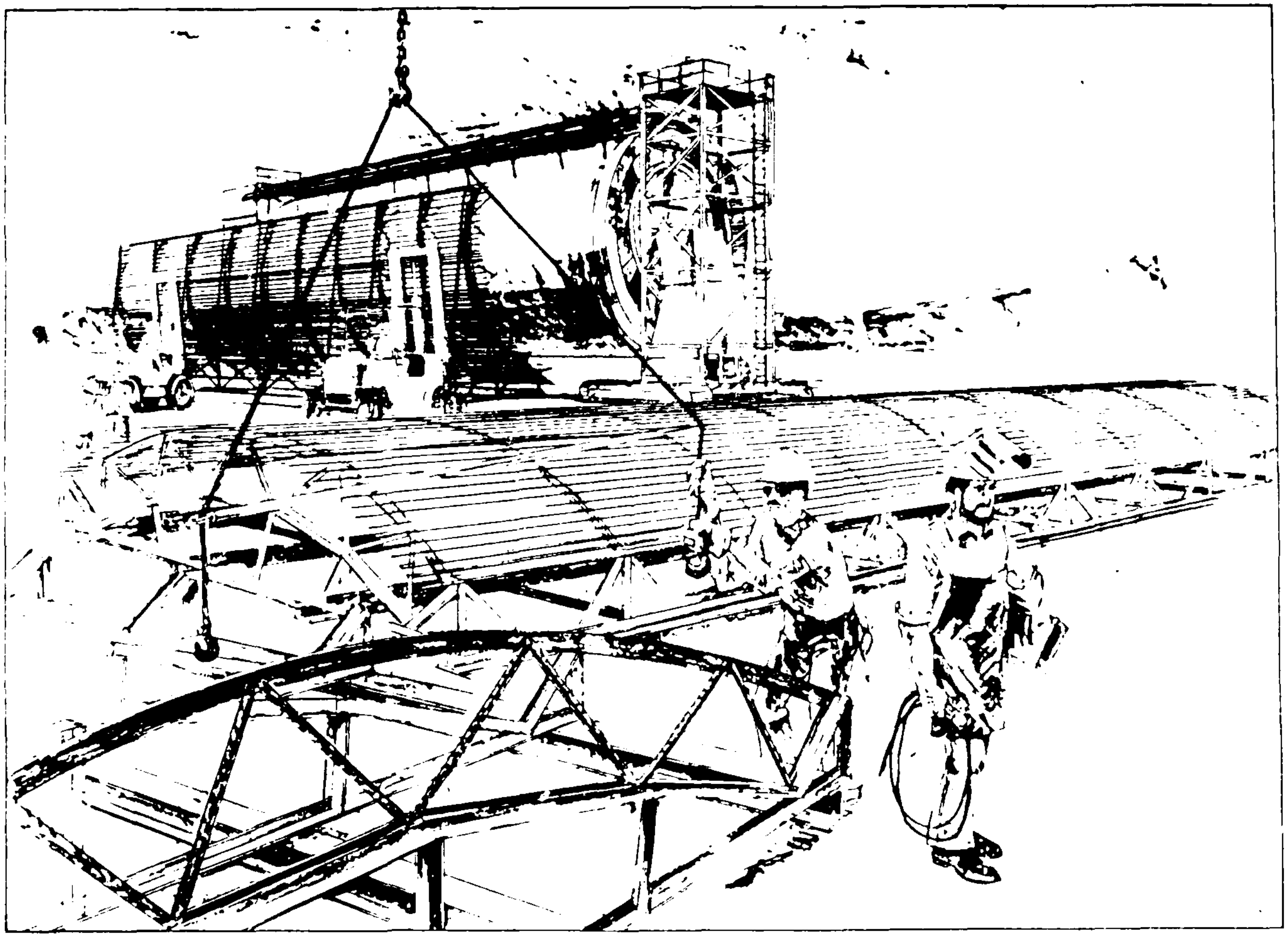
Backfilling (5.4.1.3)

One of the final construction items is the backfilling of the shelter trench. While the backfill is being placed, it must also be compacted. A pneumatic backfilling system is ideal for this job since it places and compacts the backfill in one operation. Figure 5.4.1.3-1 is a schematic drawing of a shelter trench being backfilled. The pneumatic backfilling system is shown in more detail in Figure 5.4.1.3-2.

MECHANIZED CAST-IN-PLACE METHOD (5.4.2)

Mechanized cast-in-place construction is a method whereby the protective shelter is completely formed and poured at each of the shelter sites. The concrete plants required to support the cast-in-place method are more numerous than that for the precast method. This is because the concrete is hauled by batch trucks to the site and there is a maximum time limit for placing the concrete once it has been mixed. This time limit can be translated into a mileage, or distance requirement, which sets the number of concrete plants needed for a particular deployment alternative. It is estimated that between 100 and 200 concrete plants will be used for the mechanized cast-in-place method. Construction camps are not located at every concrete plant, but are situated basically the same as in the precast method. The concrete plants are still near aggregate sources and water wells; however, the construction camp area is the primary location for storing cement, steel, flyash, and other materials required for construction. Figure 5.4.2-1 is a schematic drawing of a typical mechanized cast-in-place concrete plant.

The major work items for the mechanized cast-in-place method are excavating the trench and the ramp, forming and pouring the concrete shelter, and backfilling



SOURCE: R. A. HANSON CO. INC., MAY 1980

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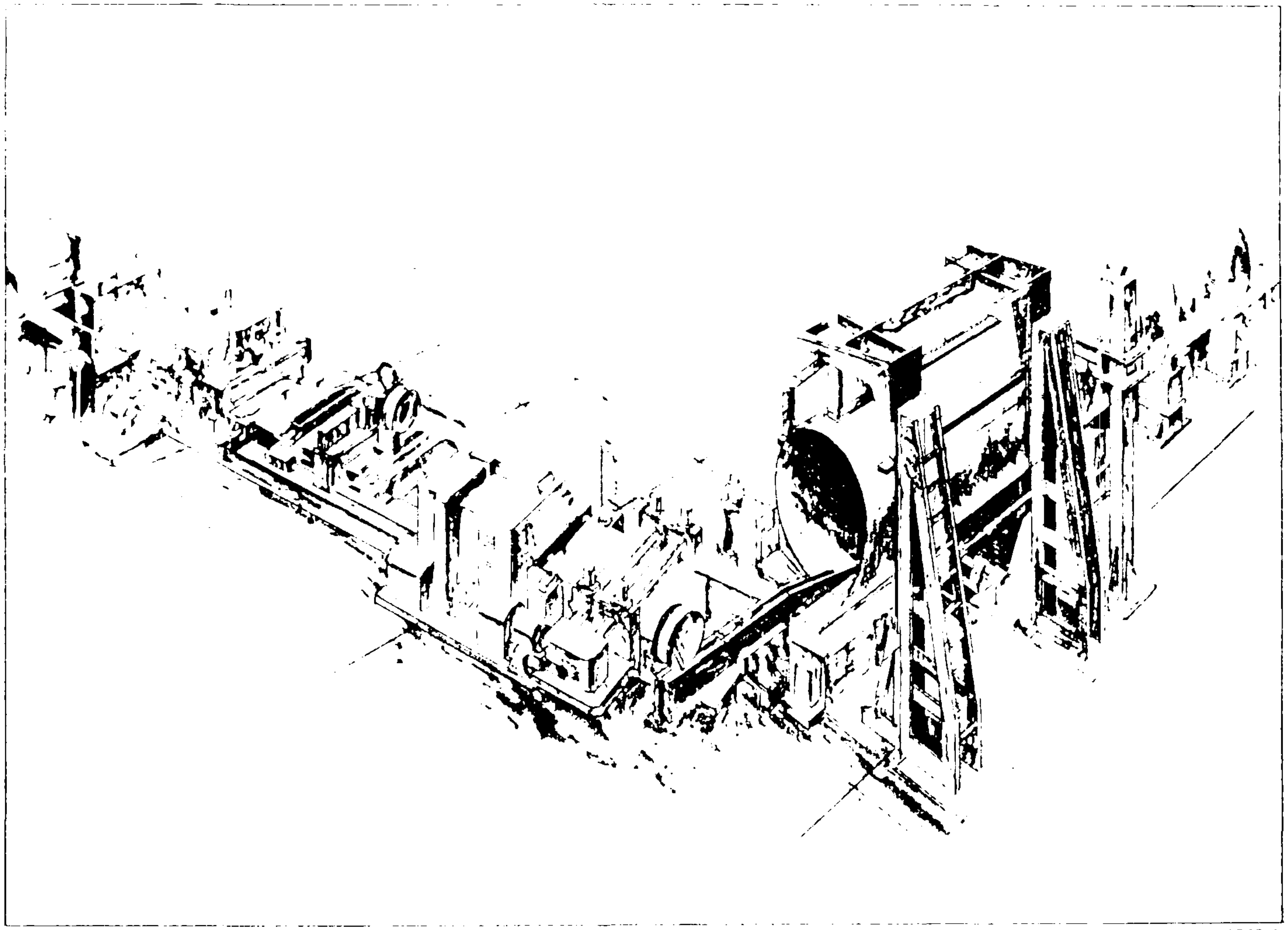
Figure 5.4.1.2-1. Liner/rebar fabrication facility.



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Source: R. A. Hanson Co. Inc., May 1980.

Figure 5.4.1.2-2. Spiral weld pipe mill.

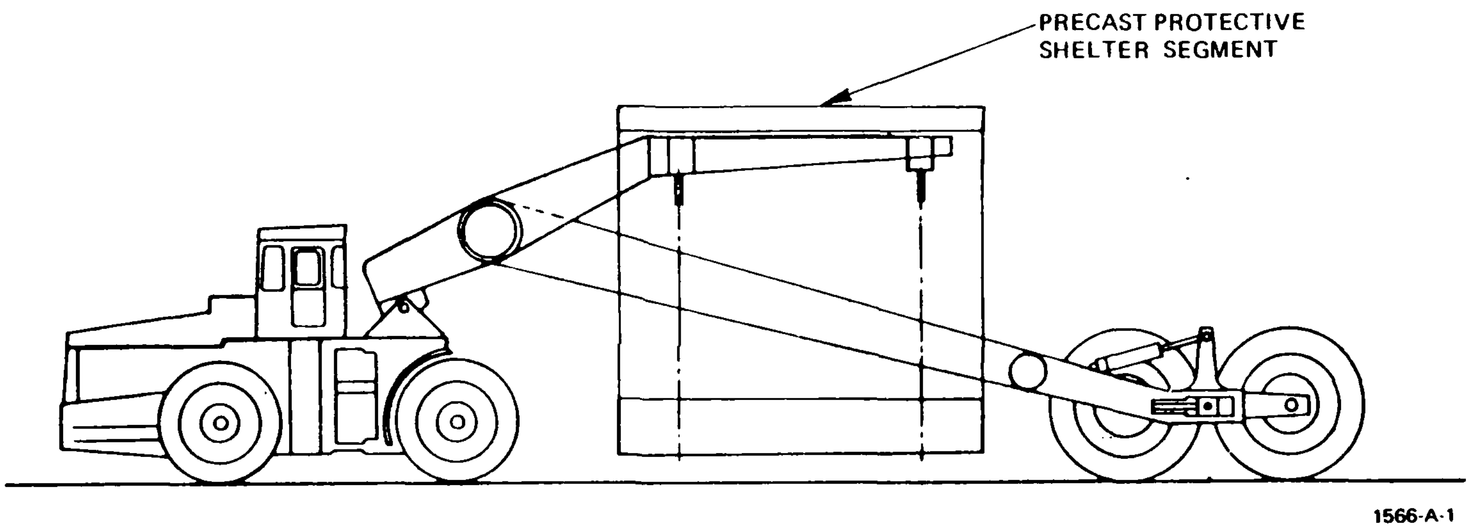


Figure 5.4.1.2-3. Pipemobile.

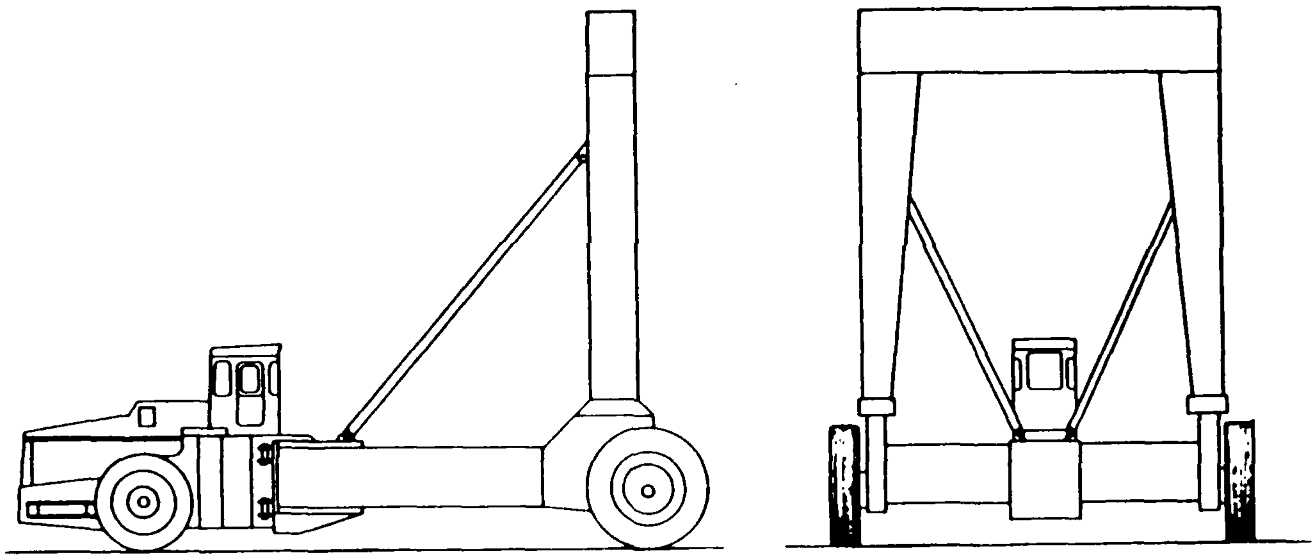
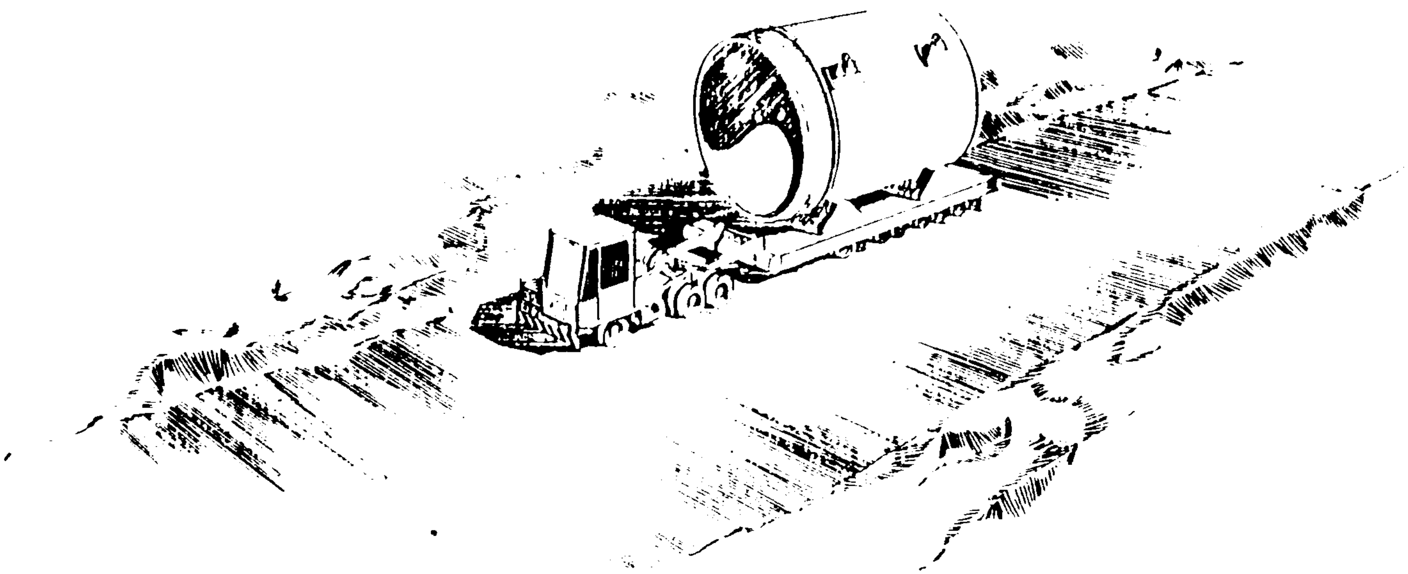


Figure 5.4.1.2-4. Liftmobile.



SOURCE: R. M. PARSONS CO., JUNE 1980

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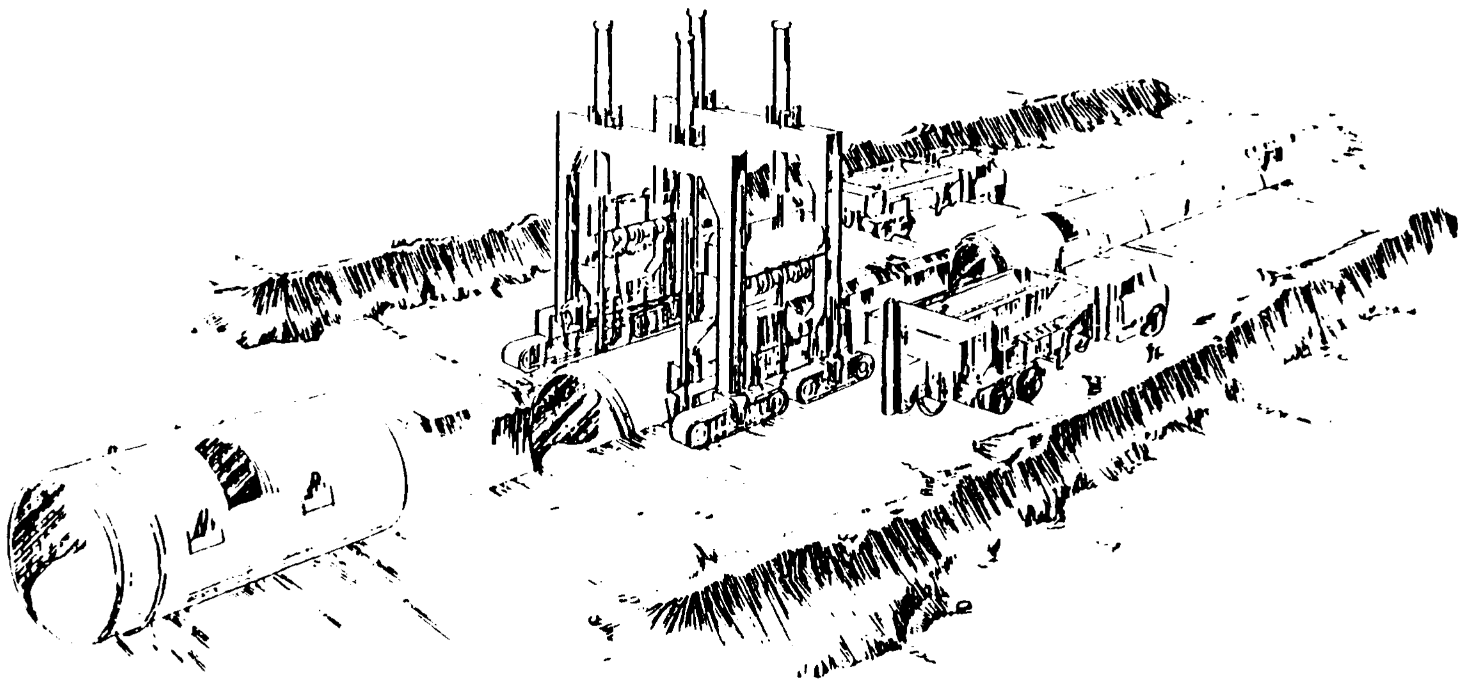
Figure 5.4.1.2-5. Tractor-trailer transporter.



SOURCE: R. M. PARSONS CO., JUNE 1980

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Figure 5.4.1.2-6. Installing jumbo.

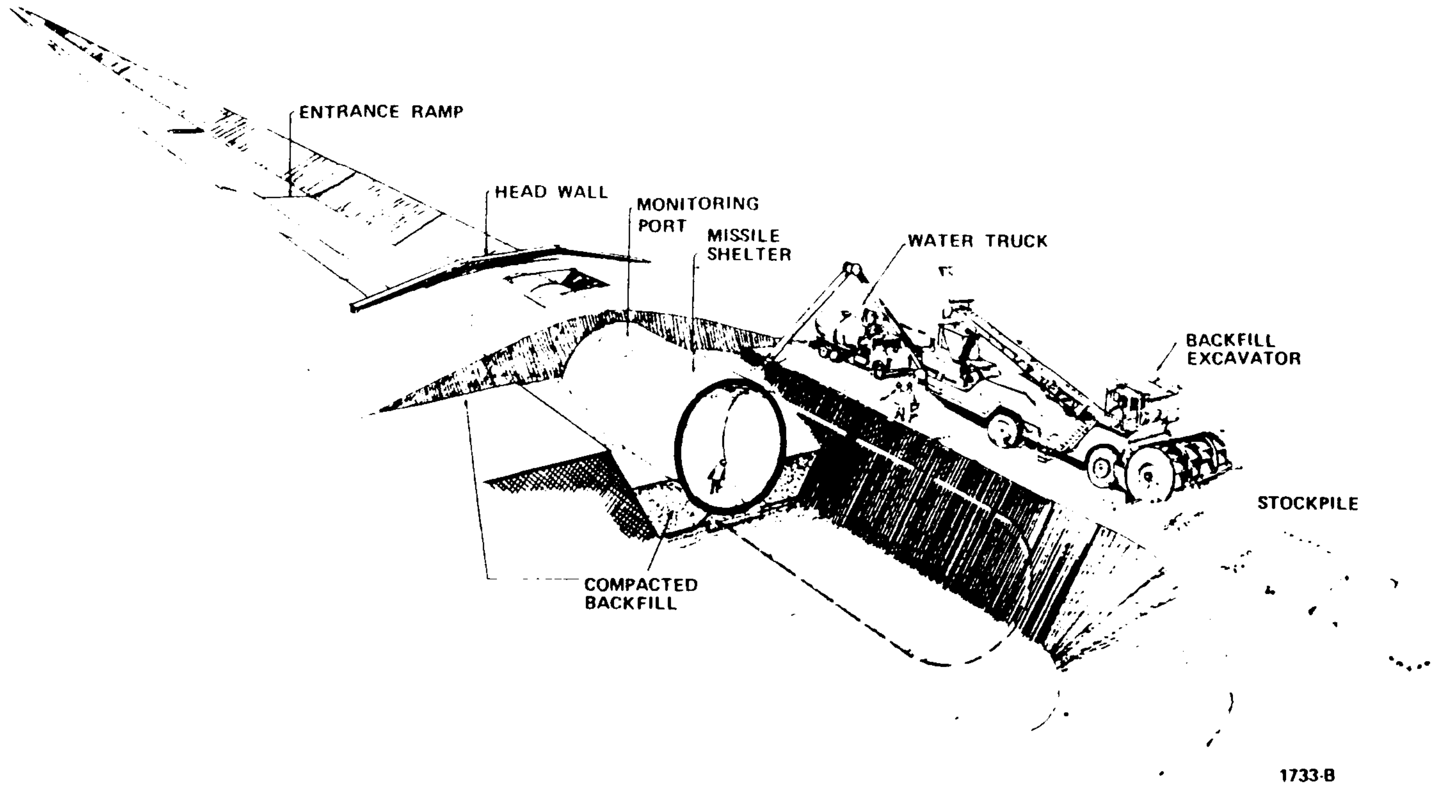


Figure 5.4.1.3-1. Backfilling protective shelter trench.

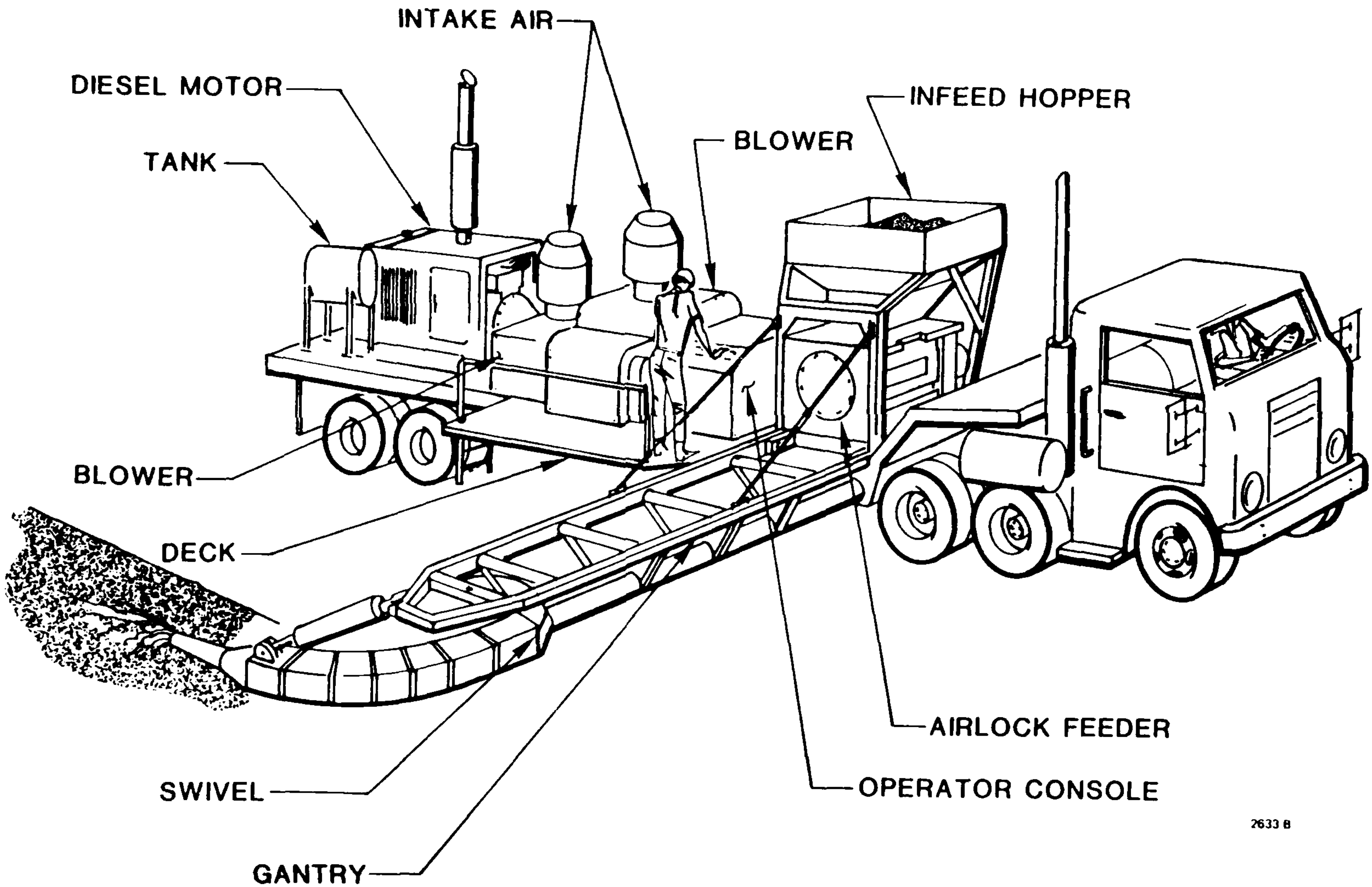
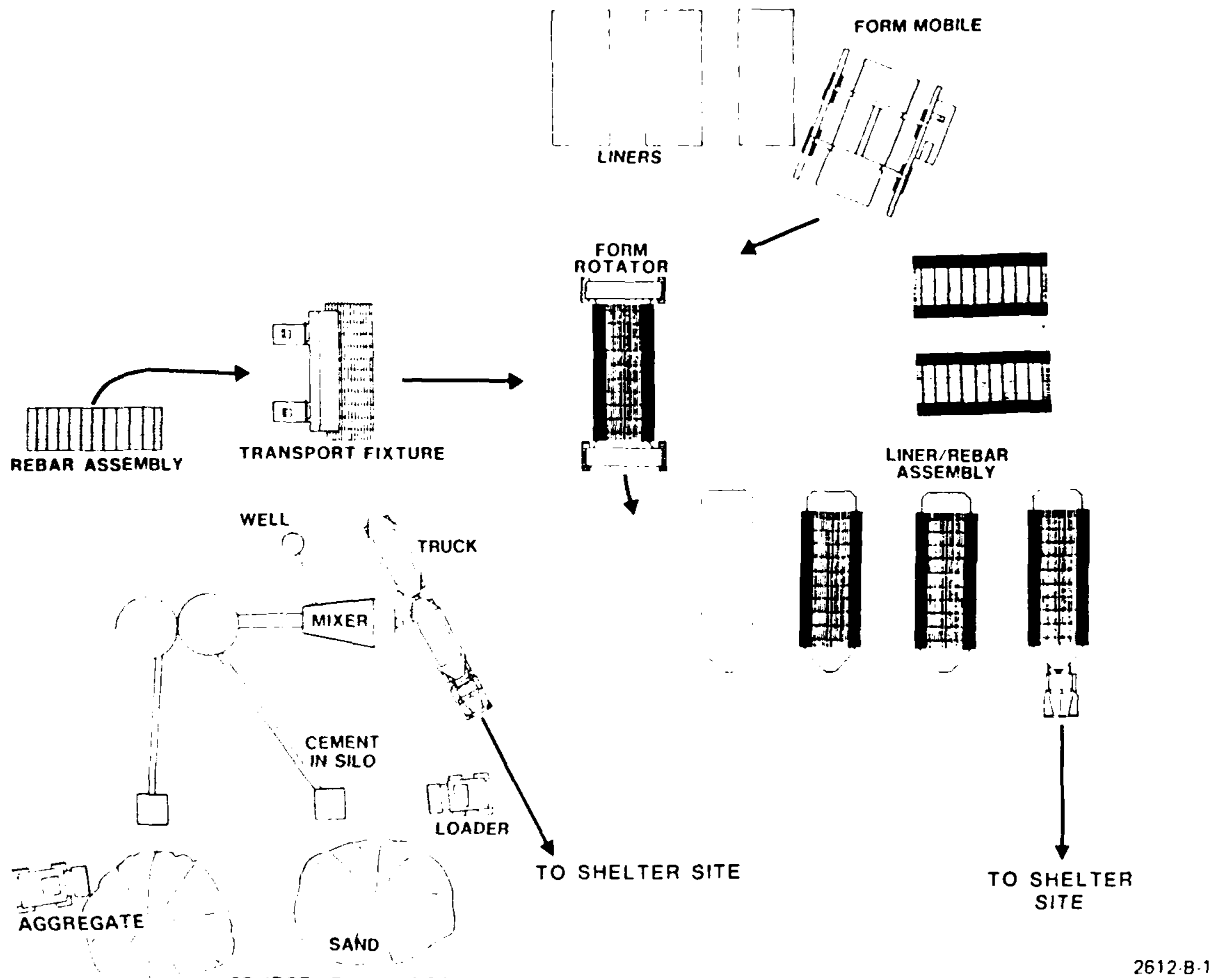


Figure 5.4.1.3-2. Pneumatic backfilling system.



SOURCE: R. A. HANSON CO. INC., MAY 1980

Figure 5.4.2-1. Mechanized cast-in-place concrete plant.

the site. As is the case with the precast method, it is anticipated that specialized equipment will be used.

Excavation (5.4.2.1)

Excavating the trench and the ramp for the mechanized cast-in-place method is similar to that for the precast method. All of the ramp is excavated by open cut. The shelter trench is excavated to the springline of concrete shelter by open cut with the remainder accomplished by contour excavation.

Open cut excavation uses the same special machine as in the precast method (see Figure 5.4.1.1-1). Other equipment is available to perform this type of excavation. This equipment, such as scrapers or bulldozers, is normally associated with highway construction. The biggest disadvantage of a scraper or a bulldozer is that they require a large area to operate in.

The contour excavation of the remainder of the shelter trench is performed in the same manner as for precast construction. Figure 5.4.2.1-1 is a more detailed drawing of the contour excavating machine illustrated in Figure 5.4.1.1-3. The semicircular trench is the outside form for the bottom half of the concrete shelter.

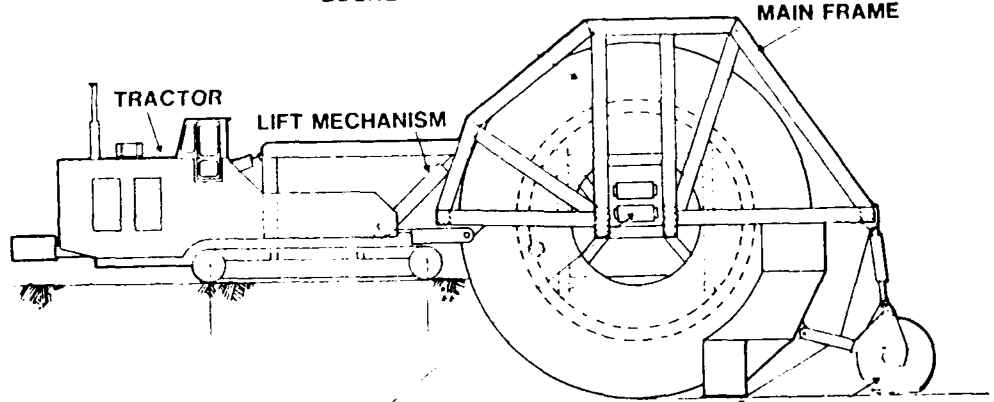
Cast-In-Place Shelter (5.4.2.2)

In the mechanized cast-in-place method, reinforcing steel and steel liners are fabricated and delivered to the concrete plant where they are assembled in segments approximately 45 feet long. The steel liner/rebar assemblies are transported to the shelter site, placed in the contoured trench, and welded together, thus becoming the inside form of the concrete shelter. Then the special slipform machine is positioned over the trench, the concrete is trucked in from the concrete plant, and the shelter is poured. The concrete is vibrated in the forms to evenly distribute it around the reinforcing and eliminate any voids. The forms are removed much earlier than in the precast method, since the shelter is already in place and the only load it has to withstand is its own weight.

As with the precast operation, special equipment is required for the mechanized cast-in-place method.

The same special equipment used in making the reinforcing steel/steel liner cages in the precast method (see Figures 5.4.1.2-1 and 5.4.1.2-2) can be used in the mechanized cast-in-place method. The steel liner/rebar assemblies, or segments, must be hauled from the concrete plant to the shelter site. Figure 5.4.2.2-1 illustrates a type of transport vehicle that could be used.

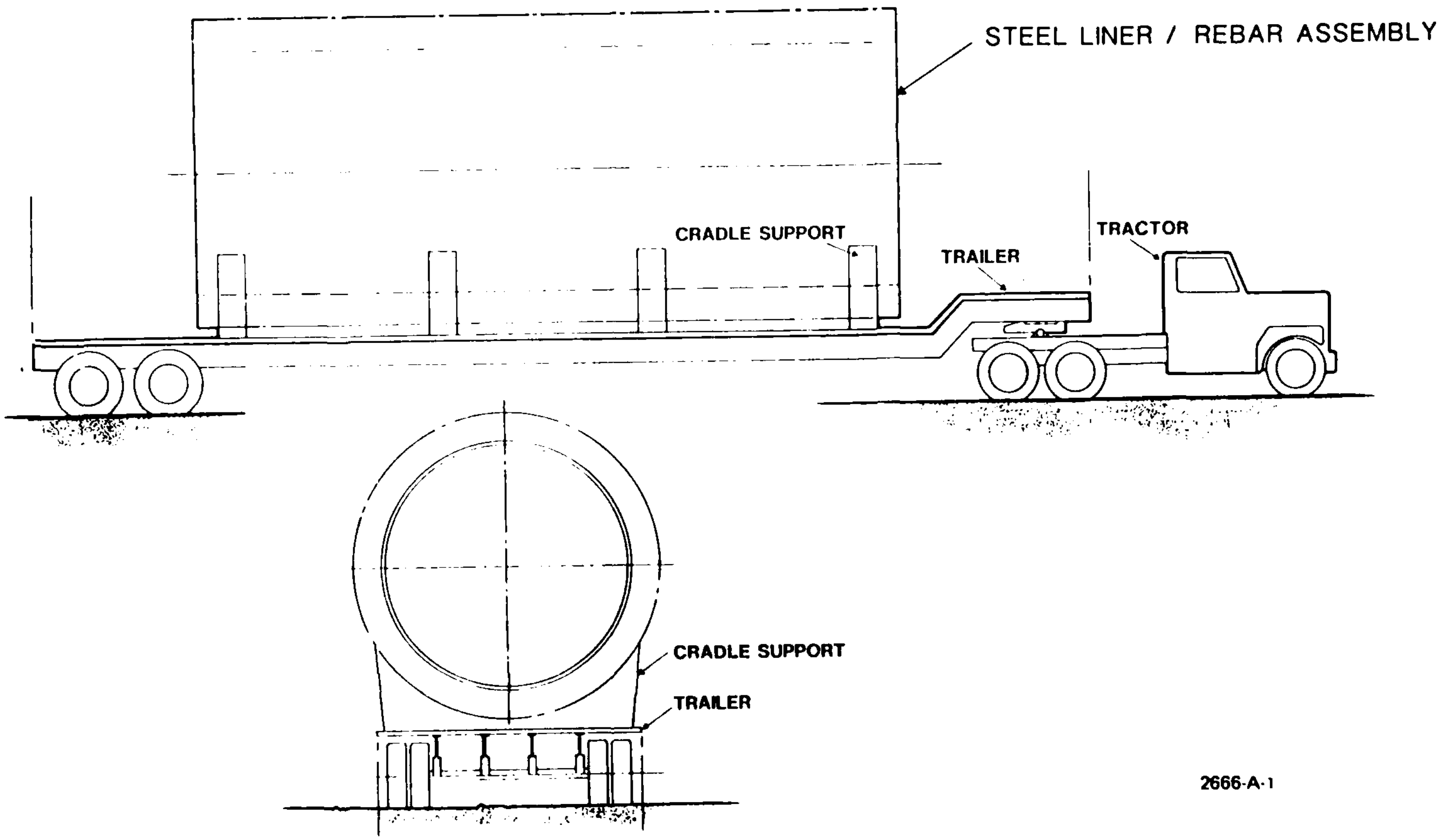
The pouring of the concrete shelter involves several types of special equipment. Figure 5.4.2.2-2 is a schematic drawing of a shelter site showing the machinery required in pouring the concrete. Some of the special equipment illustrated in this drawing are the slipform assembly, the form vibrator, and the truck unloader. The purpose of the slipform assembly is to move along the shelter trench providing the top, outside form as the concrete is poured. The slipform assembly is shown in more detail in Figure 5.4.2.2-3. The form vibrator moves along with the slipform assembly vibrating the forms and the concrete. Figure 5.4.2.2-4 is a detailed drawing of a type of form vibrator. The truck unloader moves alongside



SOURCE: R. A. HANSON CO. INC., MAY 1980

2634-A-2

Figure 5.4.2.1-1. Contour excavating machine.



SOURCE: R. A. HANSON CO. INC., MAY 1980

Figure 5.4.2.2-1. Steel liner/rebar transport trailer assembly.

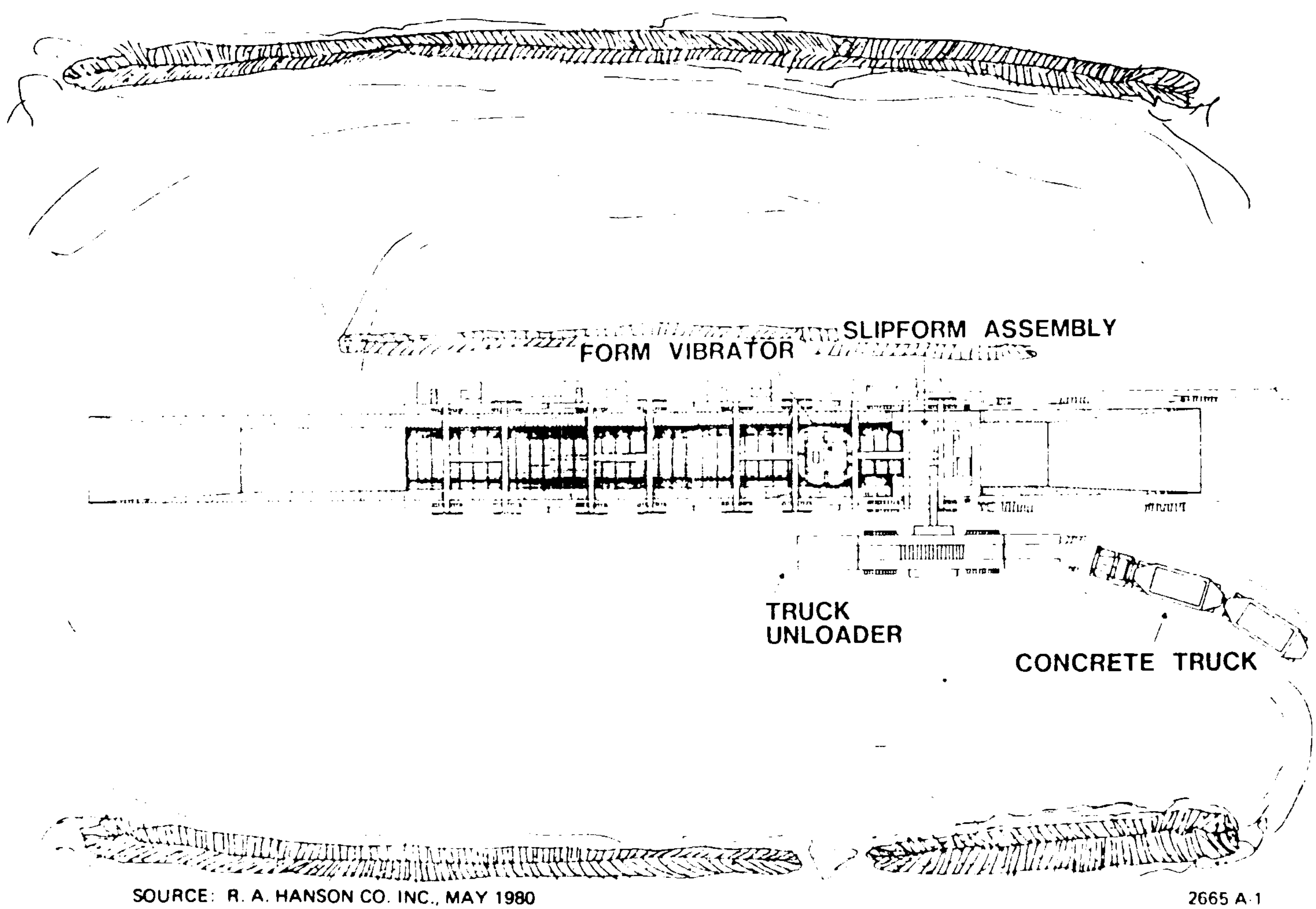
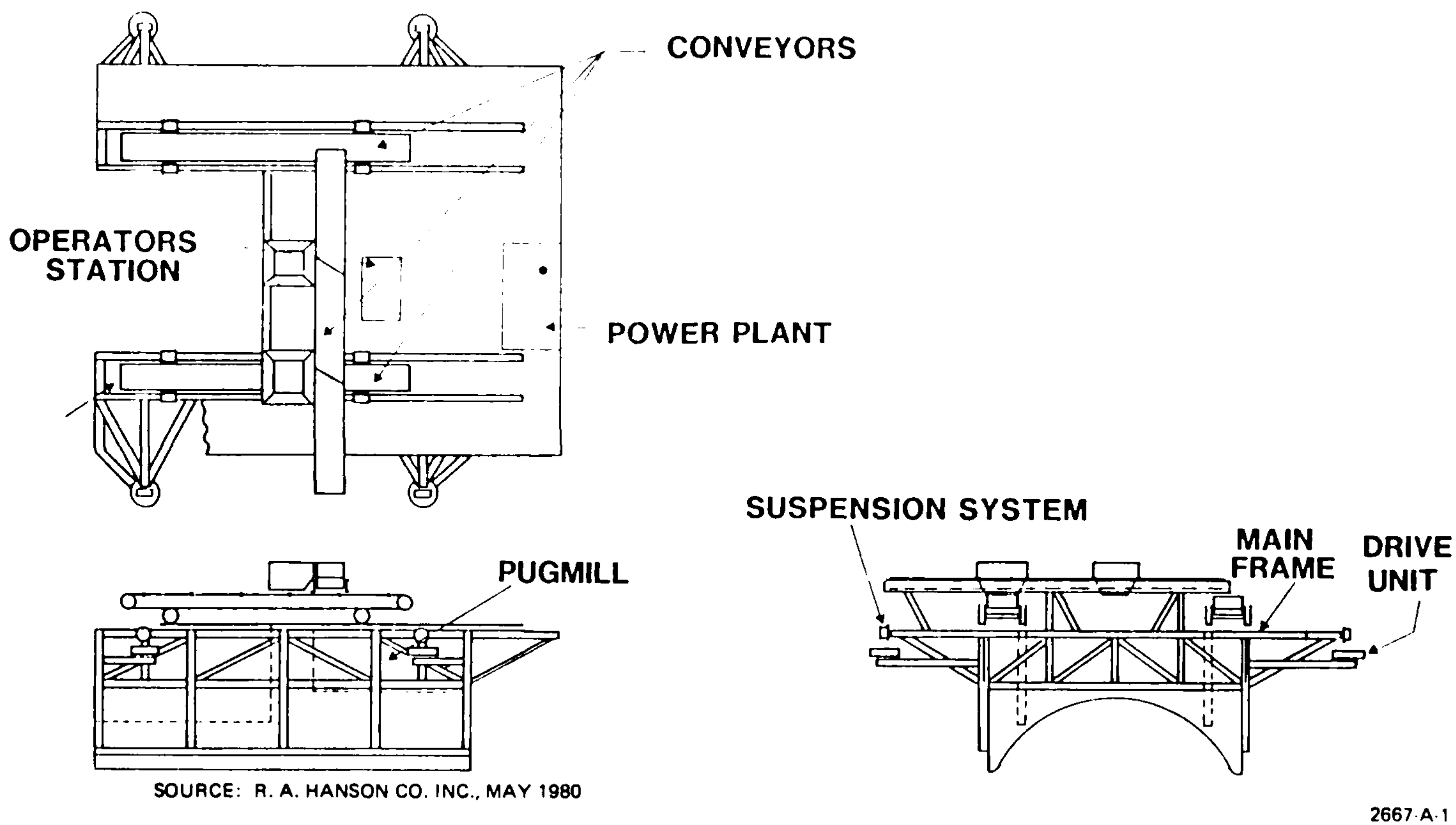
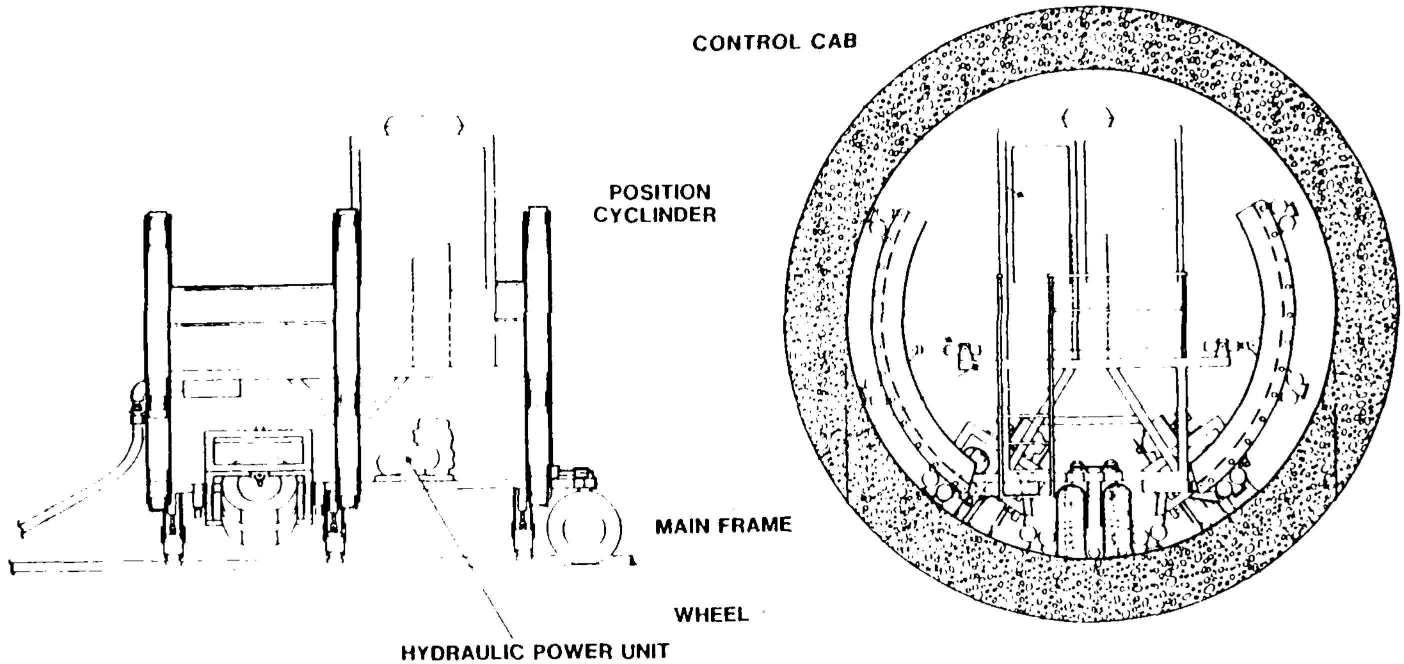


Figure 5.4.2.2-2. Pouring protective shelter.



SOURCE: R. A. HANSON CO. INC., MAY 1980

Figure 5.4.2.2-3. Slipform assembly.



SOURCE: R. A. HANSON CO. INC., MAY 1980

2672-A-1

Figure 5.4.2.2-4. Form vibrator.

the shelter trench. The concrete batch trucks drive onto the truck unloader and dump the concrete into the hopper. From the hopper the concrete is then distributed into the forms by a conveyor. Figure 5.4.2.2-5 is a drawing of a type of truck unloader that could be used.

Backfilling (5.4.2.3)

The backfilling of the shelter trench can be accomplished in the same manner as in the precast method. Refer to Figures 5.4.1.3-1 and 5.4.1.3-2 for details of the pneumatic backfilling system. If the excavation of the shelter trench and ramp is performed by scrapers and bulldozers, then the same equipment would be used in backfilling. Additionally, compaction equipment would also be required. This would probably be a padfoot compactor, another type of equipment common to highway construction (see Figure 5.4.2.3-1).

CONVENTIONAL CAST-IN-PLACE METHOD (5.4.3)

Conventional cast-in-place construction is a method in which the protective shelter is completely formed and poured at each of the shelter sites. In that regard it is the same as the mechanized cast-in-place method. Except for the use of fixed forms instead of slipforms, the conventional cast-in-place method could be almost identical with the mechanized cast-in-place. However, for the purposes of this report, it is assumed that the conventional cast-in-place method uses no special equipment unless it is absolutely required. The number and location of the concrete plants are the same as for the mechanized cast-in-place method. Figure 5.4.3-1 is a schematic drawing of a typical concrete plant for the conventional cast-in-place construction method. As in the case of the mechanized cast-in-place method, the major items of work for the conventional cast-in-place method are excavating the shelter trench and the ramp, forming and pouring the concrete shelter, and backfilling the site.

Excavation (5.4.3.1)

Excavating the shelter trench and the ramp for the conventional cast-in-place method is done by established techniques used in most highway construction. Scrapers and bulldozers are the most common types of equipment used. Figure 5.4.3.1-1 illustrates how the excavation is accomplished at a shelter site. A trapezoidal shaped section is excavated, similar to that for the precast method. The excavated material is carried by the scraper to an area adjacent to the trench, but far enough away to allow for construction of the shelter. The bulldozer is used for finer excavation. When the trench or ramp excavation gets close to the final elevation, the bulldozer is used in place of the scraper. Bulldozers are also used to excavate the side slopes and sometimes they are required to push the scrapers.

Cast-In-Place Shelter (5.4.3.2)

As in the mechanized cast-in-place method, the reinforcing steel and the steel liners are fabricated and delivered to the concrete plant site. The reinforcing steel and steel liners are then assembled in segments about 45 feet long and transported to the shelter site. Forms are set in the trench and the steel liner/rebar assemblies are then placed and become the inside forms of the concrete shelter. The concrete is trucked in from the concrete plant and is pumped into the forms. The concrete

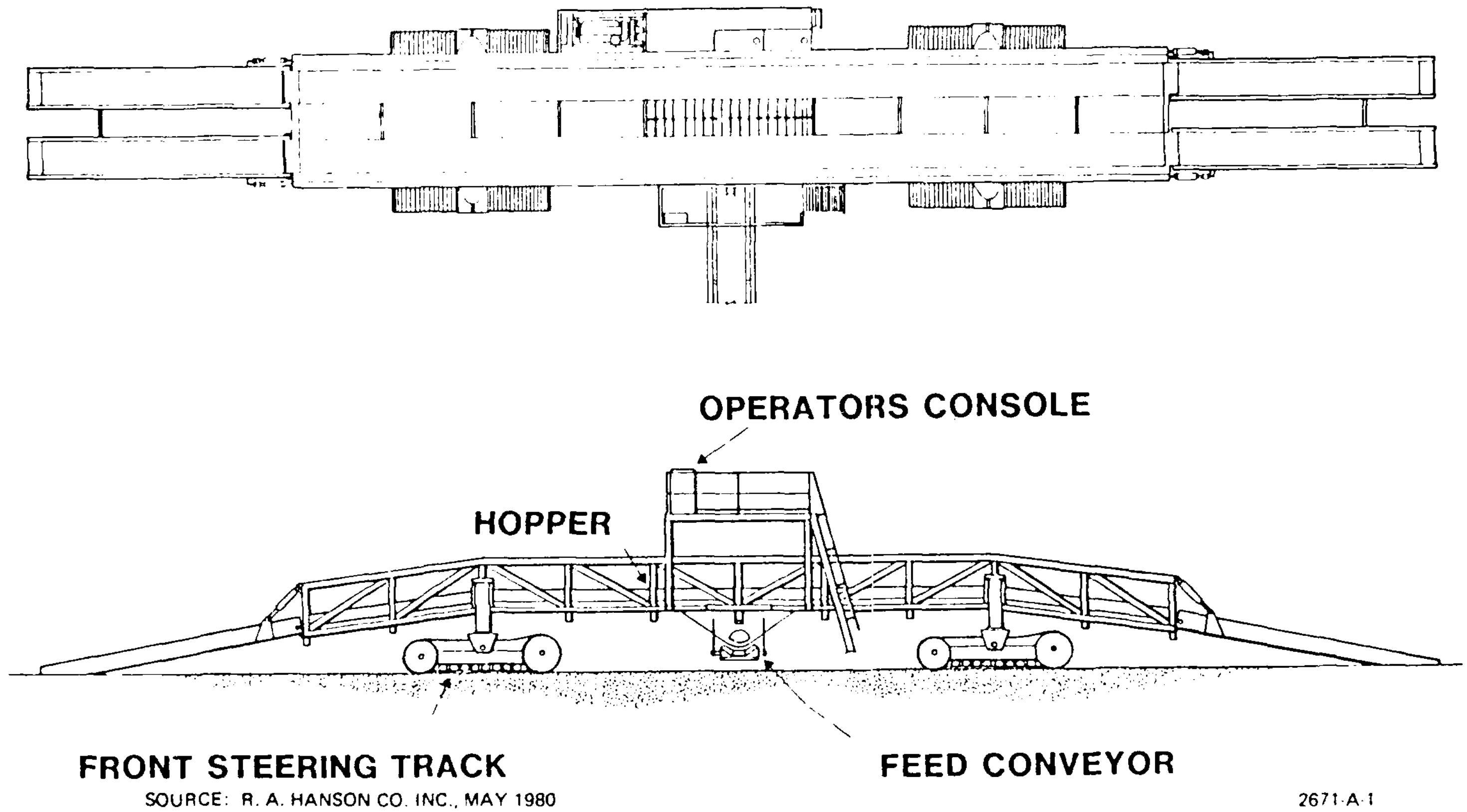


Figure 5.4.2.2-5. Truck unloader.

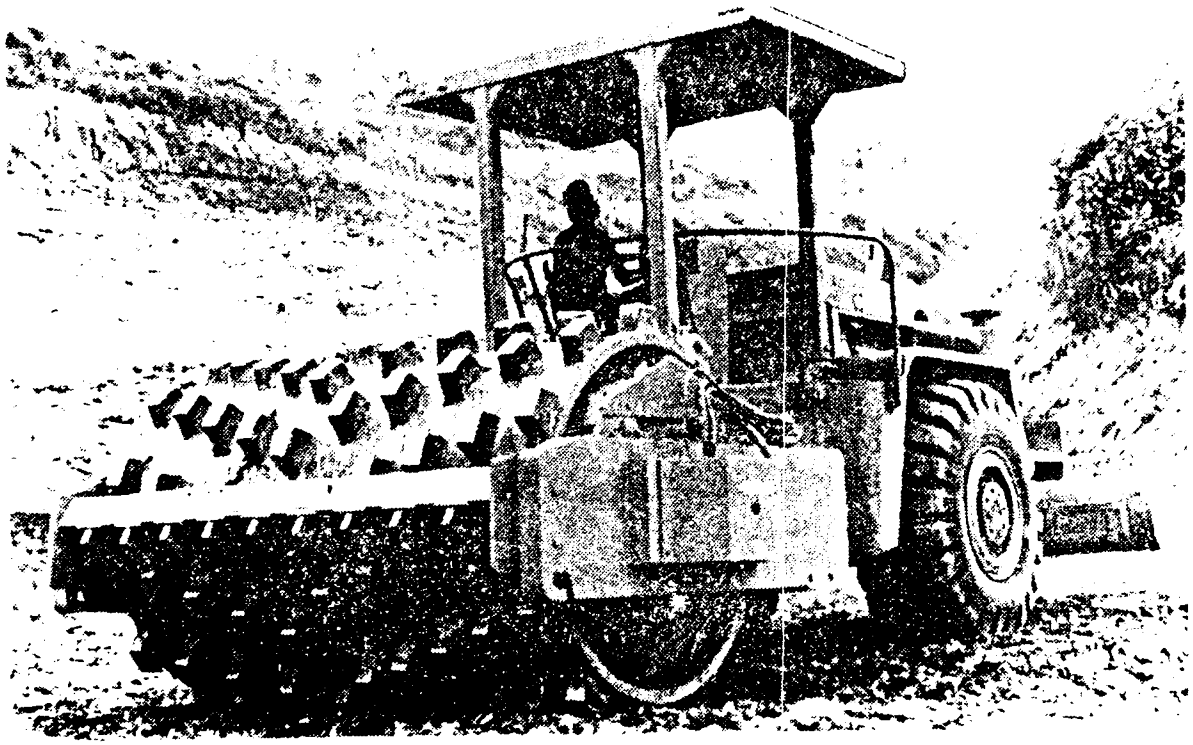


Figure 5.4.2.3-1. Padfoot compactor.

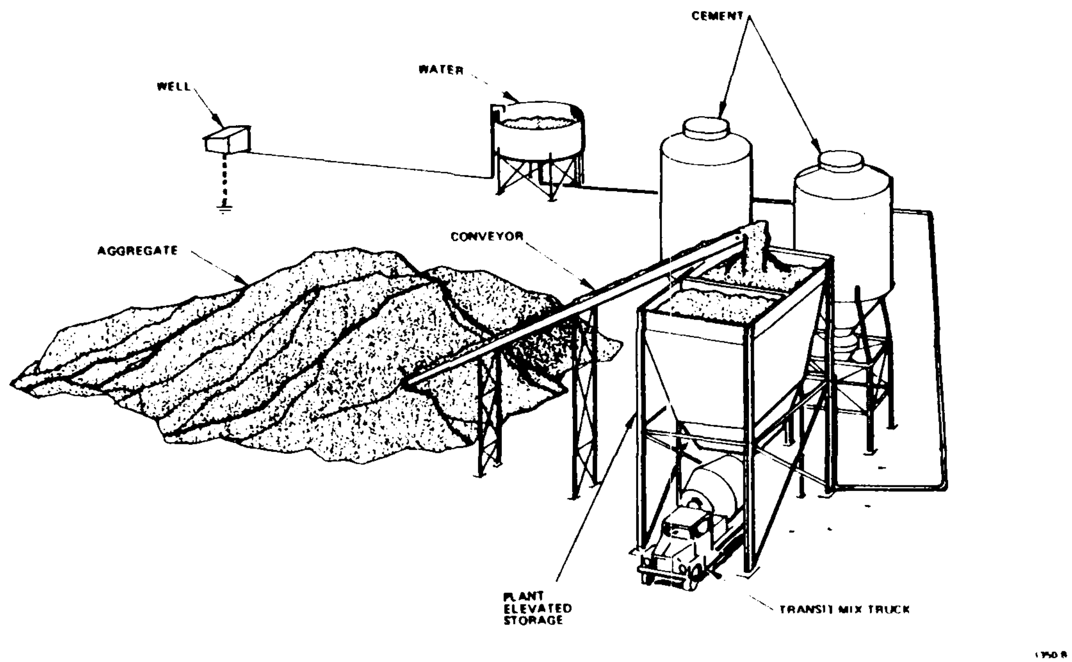


Figure 5.4.3-1. Conventional cast-in-place concrete plant.

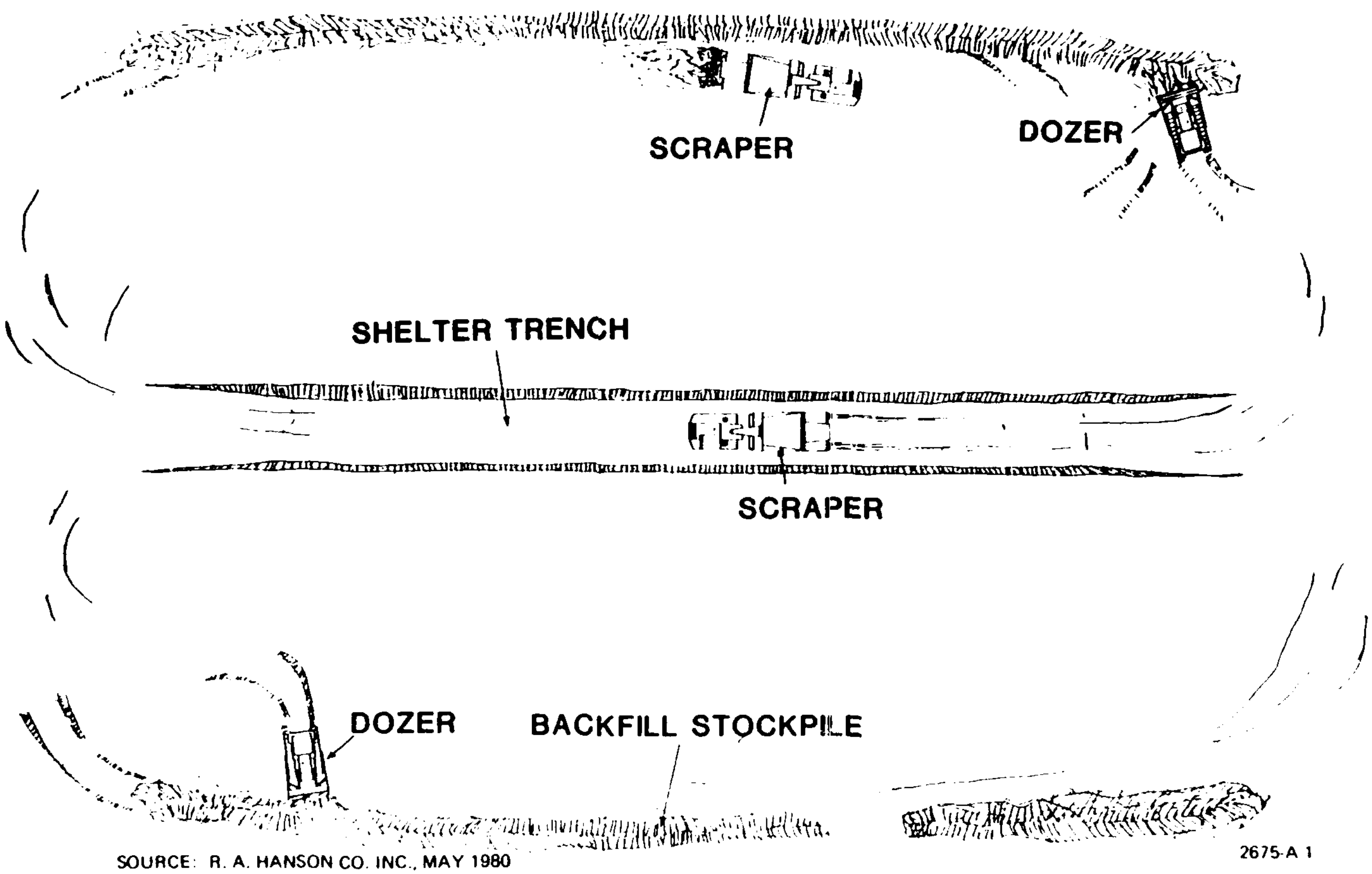


Figure 5.4.3.1-1. Conventional excavation.

and the forms are vibrated throughout the pour to insure that the concrete is evenly distributed and to eliminte voids. The forms are removed after a predetermined time, in which the concrete has gained enough strength to support its own weight.

A minimum amount of special equipment is assumed to be used in the forming and pouring of the concrete shelter. The special equipment used to fabricate the reinforcing steel and steel liners for the precast and the mechanized cast-in-place methods is also applicable for the conventional cast-in-place method (see Figures 5.4.1.2-1 and 5.4.1.2-2). Since these assemblies are not fabricated at the shelter site, a transport vehicle, such as the one illustrated in Figure 5.4.2.2-1 for the mechanized cast-in-place method, is used.

The setting of the forms is done by conventional methods using cranes to place the forms in the trench. The concrete is pumped from batch trucks into the forms by conventional concrete pumps in prevalent use in highway and building construction. Removing the forms is also done with cranes.

Backfilling (5.4.3.3)

Backfilling the shelter trench is done by conventional methods using the scrapers and bulldozers that performed the excavation. Figure 5.4.3.3-1 is a representation of the backfilling operation. The compactor used is shown in Figure 5.4.2.3-1.

5.5 ASSEMBLY AND CHECKOUT (A&CO)

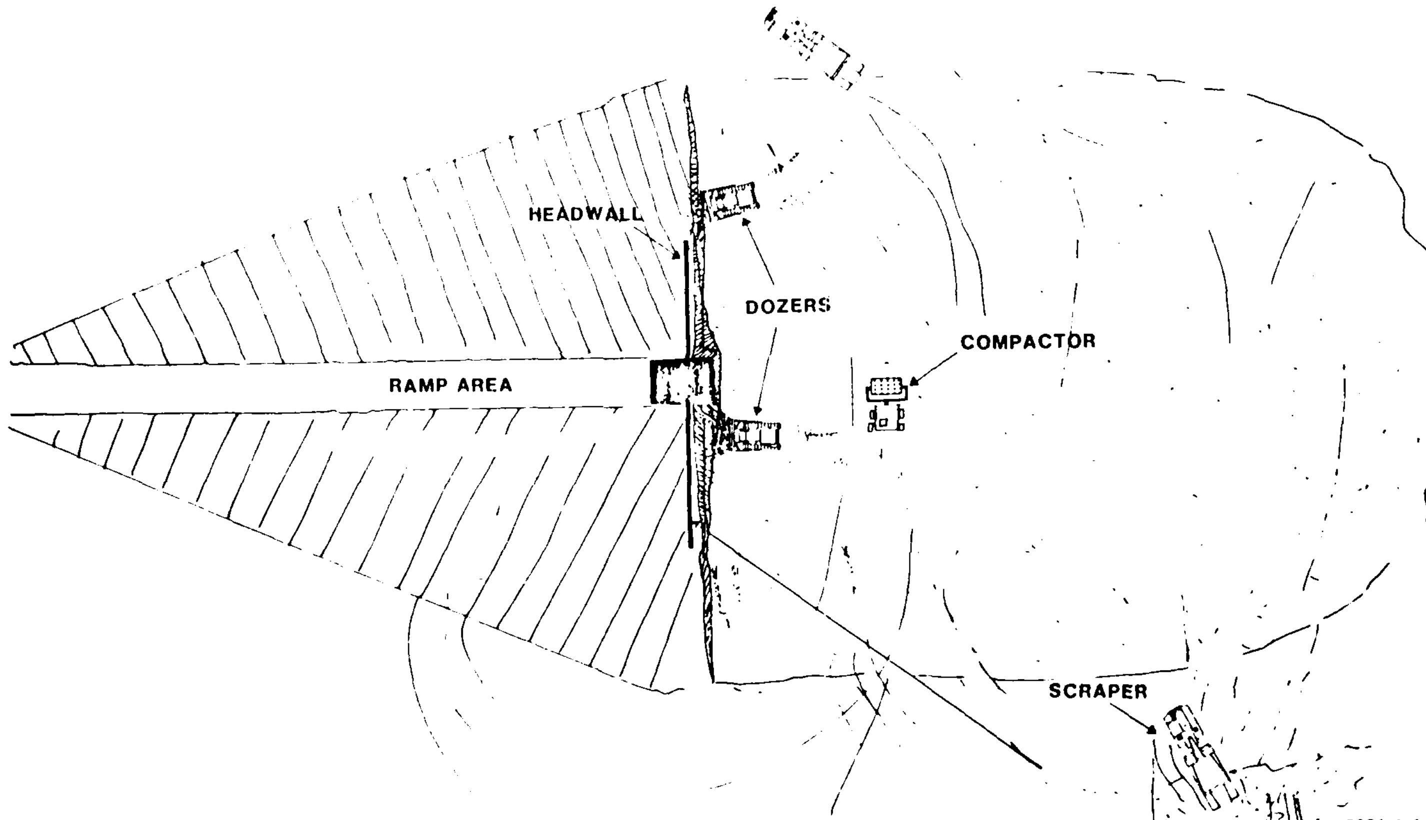
The A&CO effort encompasses not only the clusters and their associated missiles, vehicles, facilities, etc., in the DDA, but also all the technical and contractor support facilities and subsystems at the operating base complexes.

The purpose of A&CO is to install all components and subsystems of the M-X Weapons System and assure that the system operates properly.

The A&CO function begins with the acceptance of facilities from the construction contractor and receipt of weapon system components/subsystems from the manufacturer, and continues through final acceptance by the using command. A&CO operations begin at the time that facilities are available, and generally include receipt and inspection of system components, acceptance of facilities and any equipment already installed, installation of components/subsystems, checkout and integration of subsystems, system integration, demonstration of acceptable operation, turnover to the user, and preparation for operational use.

A&CO activities are conducted both by contractor personnel and by the Air Force military and civilian personnel. Their activities begin with site preparation, and continue through the time that the last operational missiles are turned over and accepted by the Strategic Air Command.

Since A&CO will follow construction, no special facilities for personnel support are expected to be required since existing construction camp facilities can be used.



SOURCE: R. A. HANSON CO. INC., MAY 1980

Figure 5.4.3.3-1. Backfilling.

5.6 DEMOBILIZATION

At the close of construction operations, construction personnel and equipment will be moved out. Water wells used for construction will be capped and locations permanently marked. Aggregate pits and mines will be closed. Haul roads, campsites, maintenance yard sites will be returned to their original state to the extent possible. Permanent facilities will be turned over to operational personnel. It should be noted that this demobilization phase will overlap, in part, the assembly and checkout (A&CO) phase, until final demobilization.

APPENDIX 1

CONSTRUCTION MODEL

LIST OF TABLES

CONSTRUCTION MODEL

The purpose of the construction model is to assemble M-X system design parameters provided by the Air Force and estimate the quantities of the major resources required to complete construction of the system. Estimates of construction quantities have been developed for each alternative for the purpose of comparison. The design of the major system components are described in Section 3. This design data was used in conjunction with a conceptual construction schedule to project both the incremental use of resources over time and the total quantity of resources required. The construction model also develops a spatial disaggregation of the construction quantities over the deployment area. Thus, the temporal and spatial disaggregation of the required construction resources such as water, personnel, and cement can be used to assess potential impacts of M-X construction.

The method was developed in order to make preliminary estimates of personnel and construction materials based upon preliminary facilities' designs and a conceptual construction schedule. It was prepared prior to completion of the final system design and the final construction plan because the socioeconomic analysis of the environmental impacts of the M-X project needed an estimate of those factors as base input data. The model was geared to providing data in the form needed for the socioeconomic analysis.

This appendix first presents the construction sequencing and schedule requirements. This is followed by a description of the methodology used by the construction model to arrive at the quantity estimates. A summary comparison of the construction requirements associated with each alternative is presented in Section 1.

1.1 FACILITY AND SCHEDULING REQUIREMENTS

Construction is scheduled to begin at the first operating base (OB) complex in 1982. The current military construction project (MCP) for fiscal year 1982 contains money for construction of facilities shown in Table 1.1-1. It should be noted that personnel estimates for OB complex construction that were developed for the DEIS do not reflect all of the facilities contained in the MCP. The most recent MCP data will be incorporated in the FEIS.

Initial operating capability (IOC) is scheduled for July 1986. Facilities that would provide IOC include 10 missiles, 230 shelters, and the first OB complex. Full operating capability (FOC) is scheduled for December 1989.

The above schedule is designed to allow deployment of approximately 5 missiles per month beginning in 1986 and ending in mid-1989 with 200 missiles deployed.

1.2 SCHEDULING PROCEDURES

At the time this model was developed, no firm construction schedule was established. A number of different scheduling options were being studied. (Refer to Section 4 for a discussion of scheduling options.) The schedule used for this analyses is therefore a conceptual schedule which is representative of the sequence of activities that would occur, regardless of which schedule is ultimately selected. It is not, however, a fixed schedule. The work in any particular area would be the same or may be scheduled two or three years earlier or later. The intensity of construction activity should be about the same as would actually occur.

The first OB will serve as the starting point for construction of the system. All work will proceed outward into the DDA from this OB. The DDA has been divided into a number of construction regions, each of which is subdivided into construction groups. Work will occur concurrently in each of the regions, proceeding from one construction group to the next within each region. The DTN will be constructed first in each segment in order to provide a roadway between the bases and the closest cluster groups. Over the roadway, equipment and materials will be moved that will be used to set up the construction camps, aggregate plants and concrete plants. Construction crews will initially be housed in temporary quarters on the OB and will successively move to the first temporary construction camp as work progresses. Similarly, construction material processing facilities, such as aggregate and concrete plants, will be portable and will be moved along with the construction crews as they proceed from one construction camp to the next. To minimize the amount of travel within a construction group, camps will be located roughly at the center of each construction group. Each segment contains approximately 12 to 15 clusters. Camps are located approximately 50 miles apart. Aggregate pits and quarries are located at sites identified by Fugro as having suitable natural material. Aggregate and concrete plants will be sited adjacent to these pits and quarries.

Once the camp and material source facilities are operational, personnel, equipment, and materials will be brought in to begin construction of the cluster roads and shelters. As this work proceeds, construction of the next portion of the DTN will begin and the camp for the next construction group will be set up. As

Table 1.1-1. M-X facilities included in the 1982 fiscal year budget.

FACILITIES
Roads in the DAA
Roads from the DAA to the OBTS
Unpaved construction roads from the DAA to various locations in the first DDA (to be paved later for use as a DTN)
Railroads from public source to and throughout the DAA
Water distribution supply, DAA
Wastewater system, DAA
Solid waste disposal facility, DAA
Storm drainage system, DAA
[illegible] kw diesel power generating plant, DAA
Buried electrical conduit system, DAA
Overhead electrical loop system, DAA and to OBTS
Substation and switching station, DAA
Central heating and cooling plant, DAA
Communications conduit network, DAA
Integrated office building, DAA
SATAF vehicle maintenance facility, DAA
Shops facility, DAA
Warehouses (2), DAA
Open field storage area
Staging area, DAA
Transporter mobile launcher assembly area, DAA
Convoy makeup area, DAA
Security, DAA
Fire station, [illegible]
Construction support
Construction camps (2), DAA and 1st DDA
Bridge cranes (2) (MAB), DAA

[illegible]240

shelters are completed in the first group, the crews will move to the next camp. All temporary facilities will be dismantled when work in an area is completed and reassembled in another location. This type of "leap frog" pattern will continue until the entire system is completed.

CONSTRUCTION ACTIVITIES (1.2.1)

This article presents a more detailed description of activities and sequencing associated with the major system facilities.

First Operating Base Complex (1.2.1.1)

1. Survey crews layout locations for temporary housing, aggregate pits, concrete plants, etc., with survey crews temporarily housed in local communities.

2. Begin construction of temporary housing.

3. Survey crews layout OB, OBTS, airfield, MAB, and support community.

4. Set up aggregate pits and quarries and concrete plants, drill water wells, and begin bringing in equipment and construction personnel.

5. Begin clearing and grubbing.

6. Construct contractor support area (CSA) and complete temporary housing.

7. Once all of the above are completed, construction of the permanent facilities can begin.

8. Marshalling yards and railroad depot facilities for construction of the roads and shelters will be established at the base and must be completed by the time construction of the DTN begins.

Second Operating Base Complex (1.2.1.2)

Construction of this base complex need not be completed until late in the project schedule. The site, however, will be used as a CSA and depot facility for construction of portions of the roads and shelters. The construction sequence will be the same as for the first OB complex for items 1 through 8 (second OB has no OBTS). Actual construction of the permanent facilities will begin at a later date, however.

Roads and Shelters (1.2.1.3)

1. With crews operating from temporary housing at the first OB, survey crews layout DTN between the OBTS and the IOC area. The IOC area will be constructed first but the sequence of construction operations for the remaining groups will be the same. The first OB and the second OB will each serve as the starting point for a construction regions.

2. Begin rough grading (cuts and fills) roadways (DTN and clusters), cross culverts where necessary, while compacting in situ areas to required density.

3. As soon as roadways are completed to the extent that heavy equipment can move into the area, shelter construction can begin.

4. As construction progresses away from the OB complex, it will become feasible to build construction camps. These camps will be located near the centroid of a given construction group, thereby holding the distance traveled to and from the construction sites to a minimum.

5. As clusters and/or groups of clusters are completed, shelter construction crews will move to new construction groups and camps.

6. As the heavy equipment is removed from the completed clusters, the fine-grading of the cluster roads can be completed. This work will move along behind the shelter construction crews.

7. After the heavy equipment required for shelter construction is moved to a new segment of DTN road and all construction traffic in the road has ceased, the DTN in the completed area can be fine-graded and paved. Upon completion of the paving operation, that segment of DTN is complete and the construction sequence is repeated until all roadways, shelters, and clusters are complete.

1.3 METHOD OF ESTIMATING CONSTRUCTION RESOURCE QUANTITIES IN THE DDA

The purpose of the construction model is to estimate, using basic design parameters, construction sites and available working days, quantities of resources associated with construction of major facilities in the DDA. The estimating procedure is to break down each of the major system components, such as shelters or roads, into individual construction tasks. The schedules, personnel and materials required for each task are then computed individually. Total system requirements are the sum of the requirements for the individual tasks.

DESIGN PARAMETERS (1.3.1)

The major design parameters include shelter design, road design and shelter spacing. The shelter design used in the model was developed in June 1980 by the Ralph M. Parsons Co. This design was for the horizontal loading dock concept which used 624 cubic yards (cy) of concrete and 85 tons of steel per shelter. Typical sections for both the cluster roads and DTN roads are presented in Section 3 of this report. A 5,200 foot spacing between shelters was used for all alternatives analyzed.

Estimates of direct construction personnel are based upon crew sizes and rates of construction developed for major construction activities. The rates for construction of shelters and roads are presented in Tables 1.3.1-1 and 1.3.1-2 respectively. The types of trucks and other major equipment used in construction of the facilities are presented in Tables 1.3.1-3 and 1.3.1-4. The number of trucks used was

Table 1.3.1-1. Construction rates for protective shelters.

ITEM	RATE/CREW/DAY	CREW SIZE
Surveying	2.5 acres	5
Excavation	4,520 cy	4
Backfill	6,400 cy	12
Compacted Subgrade	260 cy	5
Stope Stabilization	5,460 sy	2
Rock Excavation	300 cy	3
Concrete Forms	900 SFCA	6
Reinforcing Steel	2 tons	6
Placing Concrete	50 cy	9
Fencing	150 LF	6

3241-1

Table 1.3.1-2. Construction rates for DTN and cluster roads.

ITEM	RATE/CREW/DAY		CREW SIZE
Surveying	0.33	miles	5
Clearing and Grubbing	3	acres	5
Scarify and Recompact	15,000	sy	15
Roadway Excavation	3,000	cy	7
Embankment	3,000	cy	7
Rock Excavation	1,000	cy	4
Aggregate Base/Surface	920	cy	8
Bituminous Surfacing	1,500	tons	10
Prime Coat	46	tons	1
Drainage	1	each	8
Overhead Transmission	4	miles	3
Fine Grading	12.5	acres	3
Underground Transmission	5	miles	5

3242-1

Table 1.3.1-3. Equipment requirements, protective shelters.

ITEM	TYPE I EQUIPMENT
Surveying	Carry-all
Excavation	Scraper
Backfill	Dozer
Compacted Subgrade	Compactor
Slope Stabilization	Dozer
Rock Excavation	Dozer with Ripper
Concrete Forms	—
Reinforcing Steel	—
Placing Concrete	Concrete Pump
Fencing	Flatbed Truck

2937

Table 1.3.1-4. Equipment requirements, roads.

ITEM	TYPE I EQUIPMENT	TYPE II EQUIPMENT
Surveying	Carry-all	—
Clearing and Grubbing	Dozer	—
Scarify and Recompact	Motor Grader	Compactor
Roadway Excavation	Scraper	—
Embankment	Motor Grader	Compactor
Rock Excavation	Dozer with Ripper	—
Aggregate Base/Surface	Motor Grader	Compactor
Bituminous Surfacing	Paver	Roller
Prime Coat	Spray Truck	—
Drainage	Backhoe	Pipelayer
Overhead Transmission	Flatbed with Crane	—
Underground Transmission	Backhoe	—
Fine Grading	Motor Grader	Compactor

2938

calculated using average hauling distances, truck capacities and estimates of the amount of material that must be hauled per day.

The estimates of crew sizes and rates of construction were derived from standard construction estimating guides including, Dodge Manual (1978), Means Building Construction Cost Data (1980), and Caterpillar Performance Handbook (edition 11).

COMPUTER RESOURCES MODEL (1.3.2)

The initial input to the construction resources model consists of a listing of the number of shelters and miles of DTN and cluster roads associated with each construction group. A beginning and end date for construction of each component is specified which would allow the IOC and FOC requirements to be met. Table 1.3.2-1 presents as an example this basic input data for the Texas/New Mexico full deployment alternative using a conceptual construction schedule.

The design parameters, rate of construction and basic system input data are used to generate the required quantities of construction resources. Table 1.3.2-2 presents, for construction group 1, a summary of the resources required for system construction. Tables 1.3.2-3 through 1.3.2-5 present the detailed calculations required to generate resource quantities. To illustrate the method of calculation, personnel requirements for 1985 will be derived.

As shown in Table 1.3.2-2, the total number of direct construction workers needed in 1985 is 1,342. This figure is the personnel needed to construct 72 shelters, 30 miles of DTN and 251 miles of cluster roads in 1985. The personnel figures represent the average number of persons that would be needed over the course of a year. (Another way of describing it would be total man-year required.) They should not be interpreted to mean that number of people would work continually for the entire period. Many factors will cause the number of workers to vary considerably over the course of a year, including weather, material availability, and construction scheduling. The number of persons required during peak periods or slack periods may be as much as 30 percent or 40 percent higher or lower than the yearly averges Those figures do, however, represent the total personnel requirements for the year. The model generated data on yearly averages because the socioeconomic analysis, for which these estimates were proposed, is based upon average yearly requirements. Table 1.3.2-3 presents data associated with shelter construction in Group 1. Column A lists the tasks required to construct shelters. For each of these tasks personnel requirements have been calculated. For example, 5 acres of land must be surveyed and construction staked per shelter. This unit value is shown in Column B. The total area which must be surveyed for shelter construction in group 1 during 1985 is 72 shelters at 5 acres each, or a total of 359 acres as shown in Column C. The rate at which a survey crew can complete the work is 2.5 acres per shift per crew per day as shown in Column D. The number of persons which comprise a survey crew is 5 as shown in Column E. The required number of crews in 1985 is determined by dividing the total amount of work in Column C by the amount of work which a crew can perform in a year, or

$$359 \text{ acres of surveying} \div \left[260 \ \frac{\text{working days}}{\text{year}} \ \text{X} \ 2.5 \ \frac{\text{acres}}{\text{day}} \right] = 0.55 \text{ crews}$$

The total number of persons required to complete the surveying task for shelter construction in Group 1 during 1985 is 0.55 crews, shown in Column F, multiplied by

Table 1.3.2-1. Basic system construction data.

GROUP	NUMBER OF SHELTERS	MILES DTN	MILES CL. ROADS	SHELTERS		DTN		CLUSTER ROADS	
				START[1]	END	START	END	START	END
1	345.	072.	446.	24-1985	25-1987	26-1984	20-1985	48-1984	42-1986
2	322.	052.	416.	16-1985	38-1987	16-1984	12-1985	40-1984	28-1986
3	345.	141.	446.	10-1987	28-1988	10-1985	40-1985	42-1985	35-1987
4	345.	097.	446.	40-1987	20-1989	40-1986	40-1987	31-1987	40-1988
5	437.	169.	564.	20-1984	10-1986	12-1983	12-1984	20-1983	22-1985
6	184.	094.	238.	18-1985	21-1987	30-1984	32-1985	50-1984	28-1986
7	184.	064.	238.	20-1986	34-1987	28-1985	18-1986	38-1985	12-1987
8	207.	052.	267.	42-1986	31-1988	21-1986	36-1986	13-1986	24-1987
9	299.	030.	386.	51-1987	30-1989	40-1986	36-1987	10-1987	37-1986
10	230.	054.	297.	12-1988	36-1989	14-1987	46-1987	16-1987	12-1989
11	368.	155.	474.	34-1985	51-1987	1-1985	1-1986	20-1985	10-1987
12	391.	071.	505.	28-1986	25-1988	28-1985	20-1986	45-1985	42-1987
13	368.	094.	475.	20-198	15-1989	48-1985	48-1986	12-1986	18-1988
14	184.	049.	238.	30-1987	4-1989	48-1986	40-1987	12-1987	38-1988
15	301.	067.	505.	12-1988	50-1989	12-1987	46-1987	10-1987	21-1989

3243

[1]Dates are read in weeks and year; i.e., 24-1985 is the 24th week of 1985.

Table 1.3.2-2. PROJECT CONSTRUCTION EFFECTS IN GEOUNIT-GROUP1
TEX/NM LINEAR GRID FULL SYSTEM 5200 FT SPACING MAP #1617-E

QUANTITY PER YEAR

CONSTRUCTION EFFECTS	1983	1984	1985	1986	1987	1988	1989
PERSONNEL	0	182	1342	1945	384	0	0
WATER (AF)							
INCREMENTAL	0	524	2587	2266	225	0	0
CUMULATIVE	0	524	3111	5377	5602	5602	5602
DISTURBED AREA(A)							
INCREMENTAL	0	646	3957	3825	447	0	0
CUMULATIVE	0	646	4603	8428	8875	8875	8875
MATERIALS							
STEEL (TNS)							
INCREMENTAL	0	0	6109	18154	5062	0	0
CUMULATIVE	0	0	6109	24263	29325	29325	29325
CONCRETE(CY*1000)							
INCREMENTAL	0	0	45	133	37	0	0
CUMULATIVE	0	0	45	178	215	215	215
ASPHALT(TNS*1000)							
INCREMENTAL	0	195	140	0	0	0	0
CUMULATIVE	0	195	335	335	335	335	335
AGGREGATE(CY*1000)							
INCREMENTAL	0	298	1703	1121	0	0	0
CUMULATIVE	0	298	2002	3123	3123	3123	3123
PRIMECOAT(TNS)							
INCREMENTAL	0	712	512	0	0	0	0
CUMULATIVE	0	712	1224	1224	1224	1224	1224
FENCING(LF*1000)							
INCREMENTAL	0	0	97	289	81	0	0
CUMULATIVE	0	0	97	386	466	466	466
SHELTERS							
INCREMENTAL	0	0	72	214	60	0	0
CUMULATIVE	0	0	72	285	345	345	345
MILES OF DTN ROADS							
INCREMENTAL	0	42	30	0	0	0	0
CUMULATIVE	0	42	72	72	72	72	72
MILES OF CLUSTER RD							
INCREMENTAL	0	11	251	183	0	0	0
CUMULATIVE	0	11	263	446	446	446	446

SUMMARY CONSTRUCTION RESOURCES TABLES

BY CONSTRUCTION GROUP

BY YEAR

Table 1.3.2-2. IMPACT OF SHELTERS CONSTRUCTION ON GROUP1 THROUGH WORK DAY 0 IN YEAR 1986
(page 1)

NUMBER OF SHELTERS OR MILES OF ROAD = 72
NUMBER OF CONSTRUCTION DAYS= 260
HOURS/SHIFT = 8
WORK DAYS/SHIFT = 5
SHIFTS/DAY = 1

PROJECT ALTERNATIVE TEX/NM LINEAR GRID FULL SYSTEM
5200 FT SPACING MAP #1617 E

(A) DESCRIPTION	(B) CONSTRUCTION QUANTITY/MILE OR SHELTER	(C) TOTAL QUANTITY	REQUIRED WATER /UNIT MATERIAL (GAL)	TOTAL CONSTRUCTION WATER (GAL)	(D) CONSTRUCTION RATE /CREW SHIFT	(E) PERSONNEL /CREW
SURVEYING	0 50000E+01	0.35938E+03	*	*	0.25000E+01	0 50000E+01
EXCAVATION	0 17840E+05	0 12823E+07	*	*	0.45200E+04	0 40000E+01
BACKFILL	0 17840E+05	0 12823E+07	0 48000E+02	0.61548E+08	0 64000E+04	0 12000E+02
COMPACTED SUBGRADE	0 50000E+03	0.35938E+05	0 48000E+02	0 17250E+07	0.26000E+03	0 50000E+01
SLOPE STABILIZATION	0 36400E+04	0 26163E+06	0 25000E+00	0.65406E+05	0 54600E+04	0 20000E+01
ROCK EXCAVATION	0 89000E+03	0.63769E+05	*	*	0.30000E+03	0 30000E+01
CONCRETE FORMS	0 18400E+05	0 13225E+07	*	*	0.90000E+03	0 60000E+01
REINFORCING STEEL	0 85000E+02	0 61094E+04	*	*	0 20000E+01	0 60000E+01
PLACING CONCRETE	0 62400E+03	0 44850E+05	0 18500E+03	0 82973E+07	0.50000E+02	0 90000E+01
FENCING	0 13520E+04	0 97175E+05	*	*	0.15000E+03	0 60000E+01
DUST CONTROL	0 19000E+01	0 13656E+03	0 48400E+05	0 66096E+07	0.15000E-01	0 10000E+01
REVEGETATION	0 75000E+01	0 53906E+03	0 00000E+00	0.00000E+00	0.20000E+01	0 50000E+01
TOTALS	*	*	*	0 78245E+08	*	*

DESCRIPTION	(F) REQUIRED CREWS	(G) REQUIRED CONSTRUCTION PERSONNEL	(H) TYPE 1 EQUIPMENT /CREW	(I) TYPE 1 REQUIRED EQUIPMENT	(J) TYPE 2 EQUIPMENT /CREW	(K) TYPE 2 REQUIRED EQUIPMENT
SURVEYING	0 55288E+00	0 27644E+01	0 10000E+01	0 55288E+00	*	*
EXCAVATION	0 10911E+01	0.43644E+01	0 10000E+01	0.10911E+01	0.10000E+01	0 10911E+01
BACKFILL	0 77058E+00	0 92470E+01	0.20000E+01	0 15412E+01	*	*
COMPACTED SUBGRADE	0 53162E+00	0 26581E+01	0 20000E+01	0 10632E+01	0.10000E+01	0 53162E+00
SLOPE STABILIZATION	0 18429E+00	0 36859E+00	0 10000E+01	0 18429E+00	*	*
ROCK EXCAVATION	0 82011E+00	0 24603E+01	0 10000E+01	0.82011E+00	*	*
CONCRETE FORMS	0 56517E+01	0 33910E+02	*	*	*	*
REINFORCING STEEL	0 11749E+02	0 70493E+02	*	*	*	*
PLACING CONCRETE	0 34500E+01	0 31050E+02	0 10000E+01	0 34500E+01	*	*
FENCING	0 24917E+01	0 14950E+02	0 10000E+01	0 24917E+01	*	*
DUST CONTROL	0 35016E+02	0 35016E+02	0 10000E+01	0.35016E+02	*	*
REVEGETATION	0 10367E+01	0 51833E+01	0 10000E+01	0. 10367E+01	*	*
TOTALS	*	0 21247E+03	*	0 47247E+02	*	0 16227E+01

Table 1.3.2-3. IMPACT OF SHELTERS CONSTRUCTION ON GROUP1 THROUGH WORK DAY 0 IN YEAR 19[illegible]
(page 2)

NUMBER OF SHELTERS OR MILES OF ROAD - 72
NUMBER OF CONSTRUCTION DAYS= 260
HOURS/SHIFT = 8
WORK DAYS/SHIFT = 5
SHIFTS/DAY = 1

PROJECT ALTERNATIVE TEX/NM LINEAR [illegible] SYSTEM
5200 FT SPACING, MAP #[illegible]

DESCRIPTION	(L) CAPACITY /TRUCK	(M) DISTANCE /TRIP (MILES)	(N) TRIPS /DAY	(O) REQUIRED TRUCKS	(P) REQUIRED TRUCK PERSONNEL	(Q) TOTAL DIRECT LABOR
SURVEYING	*	*	*	*	*	0.27644E+01
EXCAVATION	*	*	*	*	*	0.43644E+01
BACKFILL	0.73000E+02	0.15000E+02	0.12000E+02	0.56298E+01	0.56298E+01	0.14677E+02
COMPACTED SUBGRADE	0.73000E+02	0.15000E+02	0.12000E+02	0.15779E+00	0.15779E+00	0.28159E+01
SLOPE STABILIZATION	0.14000E+03	0.15000E+02	0.12000E+02	0.59896E+00	0.59896E+00	0.96755E+00
ROCK EXCAVATION	*	*	*	*	*	0.24603E+01
CONCRETE FORMS	*	*	*	*	*	0.33910E+02
REINFORCING STEEL	0.32000E+02	0.30000E+03	0.10000E+01	0.73430E+00	0.73430E+00	0.71227E+02
PLACING CONCRETE	0.10000E+02	0.50000E+02	0.30000E+01	0.57500E+01	0.57500E+01	0.36800E+02
FENCING	0.13020E+04	0.30000E+03	0.10000E+01	0.28706E+00	0.28706E+00	0.15237E+02
DUST CONTROL	0.27000E-02	0.10000E+02	0.12000E+02	0.16211E+02	0.16211E+02	0.51227E+02
REVEGETATION	0.54000E-02	0.10000E+02	0.12000E+02	0.31996E+02	0.31996E+02	0.27179E+02
TOTALS	*	*	*	0.61365E+02	0.61365E+02	0.27383E+03

DESCRIPTION	(R) TOTAL CONTRACTED PERSONNEL	WATER USE /PERSON/DAY (GAL/PERS*DAY)	PERSONNEL WATER USE/DAY (GAL/DAY)	PERSONNEL WATER USE (GAL)
SURVEYING	0.46995E+01	0.74000E+02	0.34776E+03	0.90419E+05
EXCAVATION	0.74194E+01	0.85000E+02	0.63065E+03	0.16397E+06
BACKFILL	0.25291E+02	0.85000E+02	0.21497E+04	0.55892E+06
COMPACTED SUBGRADE	0.47870E+01	0.85000E+02	0.40690E+03	0.10579E+06
SLOPE STABILIZATION	0.16448E+01	0.85000E+02	0.13981E+03	0.36351E+05
ROCK EXCAVATION	0.41826E+01	0.85000E+02	0.35552E+03	0.92435E+05
CONCRETE FORMS	0.57647E+02	0.85000E+02	0.49000E+04	0.12740E+07
REINFORCING STEEL	0.12109E+03	0.85000E+02	0.10293E+05	0.26761E+07
PLACING CONCRETE	0.62560E+02	0.85000E+02	0.53176E+04	0.13826E+07
FENCING	0.25903E+02	0.85000E+02	0.22018E+04	0.57246E+06
DUST CONTROL	0.87086E+02	0.85000E+02	0.74023E+04	0.19246E+07
REVEGETATION	0.63204E+02	0.85000E+02	0.53724E+04	0.13968E+07
TOTALS	0.46551E+03	*	0.39517E+05	0.10274E+08

Table 1.3.2-4. IMPACT OF NEW DTN CONSTRUCTION ON GROUP1 THROUGH WORK DAY 0 IN YEAR 1986
(page 1)

NUMBER OF SHELTERS OR MILES OF ROAD = 30
NUMBER OF CONSTRUCTION DAYS= 260
HOURS/SHIFT = 8
WORK DAYS/SHIFT = 5
SHIFTS/DAY = 1

PROJECT ALTERNATIVE TEX/NM LINEAR GRID FULL SYSTEM
5200 FT SPACING MAP #1617-E

DESCRIPTION	CONSTRUCTION QUANTITY/MILE OR SHELTER	TOTAL QUANTITY	REQUIRED WATER /UNIT MATERIAL (GAL)	TOTAL CONSTRUCTION WATER (GAL)	CONSTRUCTION RATE /CREW SHIFT	PERSONNEL /CREW
SURVEYING	0.10000E+01	0.30130E+02	*	*	0.33000E+00	0.50000E+01
CLEARING & GRUBBING	0.78000E+01	0.23502E+03	0.24200E+04	0.56874E+06	0.30000E+01	0.50000E+01
SCARIFY AND RECOMPACT	0.20000E+05	0.60261E+06	0.32000E+02	0.19283E+08	0.15000E+05	0.15000E+02
ROAD EXCAVATION	0.15000E+05	0.45196E+06	*	*	0.30000E+04	0.70000E+01
EMBANKMENT	0.15000E+05	0.45196E+06	0.48000E+02	0.21694E+08	0.30000E+04	0.70000E+01
ROCK EXCAVATION	0.61000E+03	0.18380E+05	*	*	0.10000E+04	0.40000E+01
AGGREGATE BASE	0.54600E+04	0.16451E+06	0.26000E+03	0.42773E+08	0.92000E+03	0.80000E+01
BITUMINOUS SURFACING	0.46500E+04	0.14011E+06	*	*	0.15000E+04	0.10000E+02
PRIME COAT	0.17000E+02	0.51222E+03	*	*	0.46000E+02	0.10000E+01
DRAINAGE	0.50000E+01	0.15065E+03	*	*	0.10000E+01	0.60000E+01
OVERHEAD TRANSMISSION	0.10000E+01	0.30130E+02	*	*	0.40000E-01	0.30000E+01
DUST CONTROL	0.42000E+01	0.12655E+03	0.11200E+06	0.14173E+08	0.70000E+01	0.10000E+01
FINE GRADING	0.12400E+02	0.37362E+03	0.24000E+04	0.89668E+06	0.12500E+02	0.30000E+01
REVEGETATION	0.60000E+01	0.18078E+03	0.00000E+00	0.00000E+00	0.10000E+02	0.30000E+01
TOTALS	*	*	*	0.99389E+08	*	*

9

DESCRIPTION	REQUIRED CREWS	REQUIRED CONSTRUCTION PERSONNEL	TYPE 1 EQUIPMENT /CREW	TYPE 1 REQUIRED EQUIPMENT	TYPE 2 EQUIPMENT /CREW	TYPE 2 REQUIRED EQUIPMENT
SURVEYING	0.35117E+00	0.17559E+01	0.10000E+01	0.35117E+00	*	*
CLEARING & GRUBBING	0.30130E+00	0.15065E+01	0.10000E+01	0.30130E+00	*	*
SCARIFY AND RECOMPACT	0.15452E+00	0.23177E+01	0.70000E+01	0.10816E+01	0.20000E+01	0.30903E+00
ROAD EXCAVATION	0.57943E+00	0.40560E+01	0.30000E+01	0.17383E+01	0.10000E+01	0.57943E+00
EMBANKMENT	0.57943E+00	0.40560E+01	0.20000E+01	0.11589E+01	0.20000E+01	0.11589E+01
ROCK EXCAVATION	0.70691E-01	0.28276E+00	0.10000E+01	0.70691E-01	*	*
AGGREGATE BASE	0.68776E+00	0.55021E+01	0.10000E+01	0.68776E+00	0.20000E+01	0.13755E+01
BITUMINOUS SURFACING	0.35925E+00	0.35925E+01	0.10000E+01	0.35925E+00	0.20000E+01	0.71849E+00
PRIME COAT	0.42828E-01	0.42828E-01	0.10000E+01	0.42828E-01	*	*
DRAINAGE	0.57943E+00	0.46355E+01	0.10000E+01	0.57943E+00	0.10000E+01	0.57943E+00
OVERHEAD TRANSMISSION	0.28972E+01	0.86915E+01	0.10000E+01	0.28972E+01	*	*
DUST CONTROL	0.69532E-01	0.69532E-01	0.10000E+01	0.69532E-01	*	*
FINE GRADING	0.11496E+00	0.34488E+00	0.10000E+01	0.11496E+00	0.20000E+01	0.22992E+00
REVEGETATION	0.69532E-01	0.20860E+00	0.10000E+01	0.69532E-01	*	*
TOTALS	*	0.37062E+02	*	0.95224E+01	*	0.49507E+01

Table 1.3.2-4. IMPACT OF NEW DTN CONSTRUCTION ON GROUP1 THROUGH WORK DAY 0 IN YEAR 1986
(page 2)

NUMBER OF SHELTERS OR MILES OF ROAD = 30
NUMBER OF CONSTRUCTION DAYS= 260
HOURS/SHIFT = 8
WORK DAYS/SHIFT = 5
SHIFTS/DAY = 1

PROJECT ALTERNATIVE TEX/NM LINEAR GRID FULL SYSTEM
5200 FT. SPACING MAP #1617-E

DESCRIPTION	CAPACITY /TRUCK	DISTANCE /TRIP (MILES)	TRIPS /DAY	REQUIRED TRUCKS	REQUIRED TRUCK PERSONNEL	TOTAL DIRECT LABOR
SURVEYING	*	*	*	*	*	0.17559E+01
CLEARING & GRUBBING	0.14500E+01	0.15000E+02	0.12000E+02	0.51949E-01	0.51949E-01	0.15585E+01
SCARIFY AND RECOMPACT	0.35000E+03	0.15000E+02	0.12000E+02	0.55184E+00	0.55184E+00	0.28696E+01
ROAD EXCAVATION	*	*	*	*	*	0.40560E+01
EMBANKMENT	0.73000E+02	0.15000E+02	0.12000E+02	0.19844E+01	0.19844E+01	0.60404E+01
ROCK EXCAVATION	*	*	*	*	*	0.28276E+00
AGGREGATE BASE	0.40000E+02	0.40000E+02	0.60000E+01	0.26364E+01	0.26364E+01	0.81385E+01
BITUMINOUS SURFACING	0.12000E+02	0.40000E+02	0.60000E+01	0.74843E+01	0.74843E+01	0.11077E+02
PRIME COAT	0.80000E+01	0.40000E+02	0.60000E+01	0.41043E-01	0.41043E-01	0.83871E-01
DRAINAGE	0.50000E+01	0.30000E+03	0.10000E+01	0.11589E+00	0.11589E+00	0.47513E+01
OVERHEAD TRANSMISSION	0.10000E+01	0.30000E+03	0.10000E+01	0.11589E+00	0.11589E+00	0.88074E+01
DUST CONTROL	0.72000E-02	0.15000E+02	0.16000E+02	0.42250E+01	0.42250E+01	0.42946E+01
FINE GRADING	0.14500E+01	0.15000E+02	0.16000E+02	0.61939E-01	0.61939E-01	0.40682E+00
REVEGETATION	0.54000E-02	0.15000E+02	0.16000E+02	0.80477E+01	0.80477E+01	0.82563E+01
TOTALS	*	*	*	0.25316E+02	0.25316E+02	0.62379E+02

R

DESCRIPTION	TOTAL CONTRACTED PERSONNEL	WATER USE /PERSON/DAY (GAL/PERS*DAY)	PERSONNEL WATER USE/DAY (GAL/DAY)	PERSONNEL WATER USE (GAL)
SURVEYING	0.29849E+01	0.85000E+02	0.25372E+03	0.65967E+05
CLEARING & GRUBBING	0.26494E+01	0.85000E+02	0.22520E+03	0.58552E+05
SCARIFY AND RECOMPACT	0.48783E+01	0.85000E+02	0.41465E+03	0.10781E+06
ROAD EXCAVATION	0.68952E+01	0.85000E+02	0.58609E+03	0.15238E+06
EMBANKMENT	0.10269E+02	0.85000E+02	0.87283E+03	0.22694E+06
ROCK EXCAVATION	0.48070E+00	0.85000E+02	0.40859E+02	0.10623E+05
AGGREGATE BASE	0.13835E+02	0.85000E+02	0.11760E+04	0.30576E+06
BITUMINOUS SURFACING	0.18831E+02	0.85000E+02	0.16006E+04	0.41616E+06
PRIME COAT	0.14258E+00	0.85000E+02	0.12117E+02	0.31510E+04
DRAINAGE	0.80773E+01	0.85000E+02	0.68657E+03	0.17851E+06
OVERHEAD TRANSMISSION	0.14973E+02	0.85000E+02	0.12727E+04	0.33089E+06
DUST CONTROL	0.73007E+01	0.85000E+02	0.62056E+03	0.16135E+06
FINE GRADING	0.69159E+00	0.85000E+02	0.58785E+02	0.15284E+05
REVEGETATION	0.14036E+02	0.85000E+02	0.11930E+04	0.31019E+06
TOTALS	0.10604E+03	*	0.90137E+04	0.23436E+07

Table 1.3.2-5. IMPACT OF CLUSTER CONSTRUCTION ON GROUP1 THROUGH WORK DAY 0 IN YEAR 1986
(page 1)

NUMBER OF SHELTERS OR MILES OF ROAD = 251
NUMBER OF CONSTRUCTION DAYS= 260
HOURS/SHIFT = 8
WORK DAYS/SHIFT = 5
SHIFTS/DAY = 1

PROJECT ALTERNATIVE TEX/NM LINEAR GRID FULL SYSTEM
5200 FT SPACING MAP #1617 E

DESCRIPTION	CONSTRUCTION QUANTITY/MILE OR SHELTER	TOTAL QUANTITY	REQUIRED WATER /UNIT MATERIAL (GAL)	TOTAL CONSTRUCTION WATER (GAL)	CONSTRUCTION RATE /CREW SHIFT	PERSONNEL /CREW
SURVEYING	0.10000E+01	0.25144E+03	*	*	0.33000E+00	0.50000E+01
CLEARING AND GRUBBING	0.81000E+01	0.20367E+04	0.24200E+04	0.49288E+07	0.30000E+01	0.50000E+01
SCARIFY AND RECOMPACT	0.21700E+05	0.54563E+07	0.32000E+02	0.17460E+09	0.15000E+05	0.15000E+02
ROAD EXCAVATION	0.70000E+04	0.17601E+07	*	*	0.30000E+04	0.70000E+01
EMBANKMENT	0.70000E+04	0.17601E+07	0.48000E+02	0.84485E+08	0.30000E+04	0.70000E+01
ROCK EXCAVATION	0.35000E+03	0.88005E+05	*	*	0.16000E+04	0.40000E+01
AGGREGATE BASE	0.61200E+04	0.15388E+07	0.19500E+03	0.30007E+09	0.92000E+03	0.80000E+01
BITUMINOUS SURFACING	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
PRIME COAT	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
DRAINAGE	0.50000E+01	0.12572E+04	*	*	0.10000E+01	0.80000E+01
UNDERGROUND TRANSMISS	0.10000E+01	0.25144E+03	*	*	0.50000E-01	0.50000E+01
DUST CONTROL	0.45000E+01	0.11315E+04	0.57000E+05	0.64495E+08	0.50000E+01	0.10000E+01
FINE GRADING	0.13500E+02	0.33945E+04	0.24000E+04	0.81468E+07	0.12500E+02	0.30000E+01
REVEGETATION	0.60000E+01	0.15087E+04	0.00000E+00	0.00000E+00	0.10000E+02	0.30000E+01
TOTALS	*	*	*	0.63673E+09	*	*

9

DESCRIPTION	REQUIRED CREWS	REQUIRED CONSTRUCTION PERSONNEL	TYPE 1 EQUIPMENT /CREW	TYPE 1 REQUIRED EQUIPMENT	TYPE 2 EQUIPMENT /CREW	TYPE 2 REQUIRED EQUIPMENT
SURVEYING	0.29306E+01	0.14653E+02	0.10000E+01	0.29306E+01	*	*
CLEARING AND GRUBBING	0.26111E+01	0.13056E+02	0.10000E+01	0.26111E+01	*	*
SCARIFY AND RECOMPACT	0.13991E+01	0.20986E+02	0.70000E+01	0.97934E+01	0.20000E+01	0.27981E+01
ROAD EXCAVATION	0.22565E+01	0.15796E+02	0.30000E+01	0.67696E+01	*	*
EMBANKMENT	0.22565E+01	0.15796E+02	0.20000E+01	0.45131E+01	0.20000E+01	0.45131E+01
ROCK EXCAVATION	0.21155E+00	0.84621E+00	0.10000E+01	0.21155E+00	*	*
AGGREGATE BASE	0.64333E+01	0.51466E+02	0.10000E+01	0.64333E+01	0.20000E+01	0.12867E+02
BITUMINOUS SURFACING	*	*	0.00000E+00	*	0.00000E+00	*
PRIME COAT	*	*	0.00000E+00	*	0.00000E+00	*
DRAINAGE	0.48355E+01	0.38684E+02	0.10000E+01	0.48355E+01	0.10000E+01	0.48355E+01
UNDERGROUND TRANSMISS	0.19342E+02	0.96709E+02	0.10000E+01	0.19342E+02	0.10000E+01	0.19342E+02
DUST CONTROL	0.87038E+00	0.87038E+00	0.10000E+01	0.87038E+00	*	*
FINE GRADING	0.10445E+01	0.31334E+01	0.10000E+01	0.10445E+01	*	*
REVEGETATION	0.58026E+00	0.17408E+01	0.10000E+01	0.58026E+00	*	*
TOTALS	*	0.27374E+03	*	0.59935E+02	*	0.44355E+02

Table 1.3.2-5. IMPACT OF CLUSTER CONSTRUCTION ON GROUP1 THROUGH WORK DAY 0 IN YEAR 1985
(page 2)

NUMBER OF SHELTERS OR MILES OF ROAD = 251
NUMBER OF CONSTRUCTION DAYS= 260
HOURS/SHIFT = 8
WORK DAYS/SHIFT = 5
SHIFTS/DAY = 1

PROJECT ALTERNATIVE TEX/NM LINEAR GRID FULL SYSTEM
5200 FT SPACING MAP #1617 E

DESCRIPTION	CAPACITY /TRUCK	DISTANCE /TRIP (MILES)	TRIPS /DAY	REQUIRED TRUCKS	REQUIRED TRUCK PERSONNEL	TOTAL DIRECT LABOR
SURVEYING	*	*	*	*	*	0 14653E+02
CLEARING AND GRUBBING	0 14500E+01	0 15000E+02	0 12000E+02	0 45020E+00	0 45020E+00	0 13506E+02
SCARIFY AND RECOMPACT	0 35000E+03	0 15000E+02	0 12000E+02	0 49966E+01	0 49966E+01	0 25983E+02
ROAD EXCAVATION	*	*	*	*	*	0 15796E+02
EMBANKMENT	0 73000E+02	0 15000E+02	0 12000E+02	0 77279E+01	0 77279E+01	0 23524E+02
ROCK EXCAVATION	*	*	*	*	*	0 34621E+00
AGGREGATE BASE	0 40000E+02	0 40000E+02	0 60000E+01	0 24661E+02	0 24661E+02	0 76127E+02
BITUMINOUS SURFACING	0 00000E+00	0 00000E+00	0 00000E+00	*	*	*
PRIME COAT	*	*	*	*	*	*
DRAINAGE	0 50000E+01	0 30000E+03	0 10000E+01	0 96709E+00	0 96709E+00	0 39651E+02
UNDERGROUND TRANSMISS	0 50000E+01	0 30000E+03	0 10000E+01	0 19342E+00	0 19342E+00	0 76903E+02
DUST CONTROL	0 72000E-02	0 10000E+02	0 12000E+02	0 50369E+02	0 50369E+02	0 51240E+02
FINE GRADING	0 14500E+01	0 10000E+02	0 12000E+02	0 75033E+00	0 75033E+00	0 38837E+01
REVEGETATION	0 54000E 02	0 10000E+02	0 12000E+02	0 89546E+02	0 89546E+02	0 91286E+02
TOTALS	*	*	*	0 17966E+03	0 17966E+03	0 45340E+03

DESCRIPTION	TOTAL CONTRACTED PERSONNEL[1]	WATER USE /PERSON/DAY (GAL/PERS*DAY)	PERSONNEL WATER USE/DAY (GAL/DAY)	PERSONNEL WATER USE (GAL)
SURVEYING	0 24910E+02	0 85000E+02	0 21173E+04	0 55051E+06
CLEARING AND GRUBBING	0 22960E+02	0 85000E+02	0 19516E+04	0 50742E+06
SCARIFY AND RECOMPACT	0 44170E+02	0 85000E+02	0 37545E+04	0 97616E+06
ROAD EXCAVATION	0 26853E+02	0 85000E+02	0 22825E+04	0 59345E+06
EMBANKMENT	0 39990E+02	0 85000E+02	0 33992E+04	0 88379E+06
ROCK EXCAVATION	0 14385E+01	0 85000E+02	0 12228E+03	0 31792E+05
AGGREGATE BASE	0 12942E+03	0 85000E+02	0 11000E+05	0 28601E+07
BITUMINOUS SURFACING	0 00000E+00	0 00000E+00	0 00000E+00	0 00000E+00
PRIME COAT	0 00000E+00	*	*	*
DRAINAGE	0 67406E+02	0 85000E+02	0 57295E+04	0 14897E+07
UNDERGROUND TRANSMISS	0 16473E+03	0 85000E+02	0 14002E+05	0 36406E+07
DUST CONTROL	0 87108E+02	0 85000E+02	0 74041E+04	0 19251E+07
FINE GRADING	0 66023E+01	0 85000E+02	0 56120E+03	0 14591E+06
REVEGETATION	0 15519E+03	0 85000E+02	0 13191E+05	0 34296E+07
TOTALS	0 77078E+03	*	0 65516E+05	0 17034E+08

[1]Total contracted personnel includes all construction related persons who will be associated with the project. It includes Corps of Engineers personnel, construction camp personnel, maintenance and supervisory personnel as well as all direct labor.

5 persons shown in Column E, or 2.76 persons. Fractions of crews and fractions of people are shown to account for the fact that a particular task may not require a full crew for an entire year. For example, where a table shows a requirement for 0.5 crews this is interpreted to mean that one crew would be required for six months. If five persons were required for that particular crew, the table would read 2.5 persons and this would represent a requirement for 5 persons for a six month period. Similarly, a requirement for 2.5 crews for a year would actually be interpreted as requirement for 3 crews for 10 months each.

The construction personnel requirements associated with shelter construction in 1985 are determined by summing the requirements for each of the tasks as shown in Column G.

In addition to the persons directly involved with construction, persons required to drive the construction vehicles must be included. For example, the number of truck drivers associated with the backfill task in shelter construction has been determined by taking the total quantity of backfill shown in Column C of Table 1.3.2-3, and dividing it by 260, the number of working days in a year. This gives the quantity of backfill which must be moved per day. This daily amount is divided by the capacity of a truck shown in Column L. The number of trips that a truck can make is shown in Column N and is based on the trip distance, reasonable average speeds and maintenance down times. The required number of trucks as shown in Column O, is equal to the amount of backfill which must be moved daily, divided by the product of the capacity of the truck multiplied by the number of trips possible in a day. There is one driver per truck, therefore the required truck personnel shown in Column P, equals the number of trucks. The total direct labor shown in Column Q is equal to the sum of construction workers and truck drivers. The total contracted personnel shown in Column R is equal to 170 percent of the total direct labor. This multiplier of 170 percent is comprised of the following factors:

Direct Labor	100%
Workers for construction of miscellaneous facilities (CMF, etc.)	20%
Concrete plant operators	10%
Contractors staff	20%
Contingency	10%
Army Corps of Engineers inspectors	10%
Total	170%

The personnel shown in Column R of Table 1.3.2-3 is required for construction of shelters in Group 1 during 1985. The total personnel is the sum of requirements associated with shelters, DTN and cluster roads as shown by the totals of columns R on Tables 1.3.2-3, 1.3.2-4 and 1.3.2-5. This total is equal to the value shown for personnel in Group 1 during 1985 on Table 1.3.2-2. A summary presenting the totals for all the construction groups in Alternative 7 is shown in Table 1.3.2-6.

In a manner similar to the calculation of personnel, the requirements for each of the construction resources was determined. The following qualifications should

Table 1.3.2-6. TOTAL PROJECT CONSTRUCTION EFFECTS
TEX/NM LINEAR GRID FUEL SYSTEM 5200 FT. SPACING

CONSTRUCTION EFFECT*	QUANTITY PER YEAR						
	1983	1984	1985	1986	1987	1988	1989
PERSONNEL	331.	2581.	8078.	11861.	13824.	11652.	3509.
WATER (AF)							
INCREMENTAL	2597.	5172.	14734.	19544.	20425.	13065.	2223.
CUMULATIVE	2597.	7769.	22503.	42047.	62473.	75538.	77762.
DISTURBED AREA(A)							
INCREMENTAL	3444.	7571.	21640.	30500.	32243.	22208.	4311.
CUMULATIVE	3444.	11015.	32655.	63155.	95398.	117606.	121917.
MATERIALS							
STEEL(TONS)							
INCREMENTAL	0.	11163.	44482.	75297.	103077.	112092.	44889.
CUMULATIVE	0.	11163.	55645.	130942.	234019.	346111.	391000.
CONCRETE(CY*1000)							
INCREMENTAL	0.	82.	327.	553.	757.	823.	330.
CUMULATIVE	0.	82.	409.	961.	1718.	2541.	2870.
ASPHALT(TONS*1000)							
INCREMENTAL	657.	688.	2203.	1048.	1268.	0.	0.
CUMULATIVE	657.	1345.	3548.	4595.	5864.	5864.	5864.
AGGREGATE(CY*1000)							
INCREMENTAL	1643.	3223.	8620.	11880.	11491.	5211.	177.
CUMULATIVE	1643.	4866.	13486.	25366.	36857.	43067.	43244.
PRIME COAT(TONS)							
INCREMENTAL	2403.	2514.	8052.	3831.	4636.	0.	0.
CUMULATIVE	2403.	4917.	12969.	16801.	21437.	21437.	21437.
FENCING(FEET*1000)							
INCREMENTAL	0.	178.	708.	1198.	1639.	1783.	714.
CUMULATIVE	0.	178.	885.	2083.	3722.	5505.	6219.
PROTECTIVE SHELTERS							
INCREMENTAL	0.	131.	523.	886.	1213.	1319.	528.
CUMULATIVE	0.	131.	655.	1540.	2753.	4072.	4600.
MILES OF NEW ROADS							
INCREMENTAL	141.	148.	474.	225.	273.	0.	0.
CUMULATIVE	141.	289.	763.	988.	1261.	1261.	1261.
MILES OF CLUSTER RD							
INCREMENTAL	112.	425.	986.	1740.	1634.	1015.	29.
CUMULATIVE	112.	537.	1523.	3263.	4897.	5912.	5941.

*[illegible] DA construction only

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DEC 80 F04704-78-C-0029
UNCLASSIFIED M-X-ETR-31 AFSC-TR-81-46 NL

2 OF 3
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be noted, however. Water quantities shown do not include water for revegetation. Aggregate includes only quantities used for base and surface courses in road construction. Aggregate for concrete and for asphalt pavement are not included. Steel quantities include both reinforcing and plate steel. The personnel figures include only the construction workers themselves. None of their dependents are included. Also not included are additional personnel who may move into the area as a result of employment opportunities associated with M-X, but who would not work on the project itself. These are referred to as indirect workers. For a complete discussion of overall poplation impacts of the project, including construction worker dependents and indirect workers, refer to the technical report on economics, ETR #27.

1.4 METHOD OF ESTIMATING CONSTRUCTION RESOURCE QUANTITIES FOR OPERATING BASE COMPLEXES

Quantities of construction resources for base complexes were developed by estimating the requirements of each structure or component which comprises the base complex. These quantities were then disaggregated over the period of construction.

OPERATING BASE CONSTRUCTION PERSONNEL (1.4.1)

Estimates of construction personnel involved with the base complex were developed by the build up of trade skill requirements by structure. Table 1.4.1-1 presents an example estimating sheet which contains the amount of time required by each trade to complete the phases of building construction. This type of estimate was developed for each structure in the base complex, and disaggregated over the period of construction. A summary of the structures for which manpower estimates were derived is presented in Table 1.4.1-2. With regard to scheduling in full basing alternatives, construction of the OBTS and DAA, which are included in the first OB complex, begins in 1982. Construction of the first OB proper begins in 1983. Construction of the second OB begins in 1985. The manpower estimates developed for the OB complexes include inspectors provided by the Army Corps of Engineers, and a 10 percent contingency. For split basing alternatives, construction of the OB in Nevada/Utah begins in 1982 and construction of the OB in Texas/New Mexico begins in 1983. Tables presenting the estimates of direct base construction personnel are contained in Appendices B through F. As with the DDA, no dependents or indirect workers are included.

OPERATING BASE CONSTRUCTION MATERIALS (1.4.2)

The total amounts of materials associated with base construction were estimated by TRW and contained in their memo dated May 2, 1980. These total quantities were disaggregated over the construction period based on a reasonable estimate of phased construction. The construction quantities are presented in Appendices B through F.

Table 1.4.1-1. Sample manhour estimating sheet.

NO.	PHASE OF PROJECT	LABORER	CARPENTER	ENGINE OPERATOR	CEMENT MASON	PLASTERER	PAINTER	FLOOR COVERING	INSULATION WORKER	ROOFER	ELECTRICIAN	PLUMBER AND PIPEFITTER	SHEETMETAL WORKER	IRON WORKER	MECHANICAL
1	Building Layout		59												
2	Rough Grading			11											
3	Footing Excavation	40		20											
4	Pouring Concrete Footings	30		16										30	
5	Grading/Reinforcing Slab	59												20	
6	Pouring and Finishing Slab	285		36	72										
7	Form Work (Exterior Walls and Columns)	596	1,789											596	
8	Pouring (Exterior Walls and Columns)	1,683	936	187	187										
9	Form Work (Upper Slabs)		388												
10	Pouring and Finishing (Upper Slabs)														
11	Interior Walls and Floors		1,152				243	266	59						
12	Roof Framing		388												
13	Roofing									59					
14	Electrical										2,236				
15	Plumbing and Sprinklers											745			
16	H.V.A.C.														745
17	Gutters and Downspouts												99		
18	Landscaping and Vegetation	372													
19	Parking Areas	452		49											
	Totals	4,217	4,710	319	259		243	260	59	59	2,236	715	99	646	715
	Total = 14,603 man hours														
	Total + 10 percent miscellaneous = 16,063 man hours														

1108

Table 1.4.1-2. Summary of operating base complex facilities.[1]

FACILITY	COMPONENT STRUCTURE	FACILITY	COMPONENT STRUCTURE
First OB	Airfield	DAA	Roads and utilities
	Roads and parking		Heavey vehicle assembly
	Concrete buildings		MAB - assembly
	Concrete block buildings		MAB - maintenance
	Metal buildings		Re-entry system
	Wood and stucco housing		Flammable storage
	Utilities		Segregated storage magazine
	Rail spur		Storage igloos
	Golf course		Secondary guard building
Second OB	Airfield		Rail spur
	Roads and parking		Cannister storage pad
	Concrete buildings		Missile stage storage
	Concrete block buildings		Cannisterized missile storage
	Metal buildings		Ordinance storage
	Wood and stucco housing		Rail transfer
	Utilities		
	Rail spur		
	Golf course	CSA	General stores
ASC	Dormitory		Shops electrical, etc.
	Vehicle storage		Battery shop storage and disposal
	Materials and spare parts		Electrical test and maintenance
	Softball field and 4 tennis courts		Vehicle maintenance
	Helicopter pad		MOB office supplies
	Helicopter hanger		
	Vehicle maintenance shop	OBTS	Test support building
	Gymnasium		Cluster maintenance facility
	Roads and utilities		Security alert facility
			Remote surveillance site
			Roads
			Utilities

3245

[1]As contained in the DEIS, this will be updated in the FEIS to reflect the proposed FY82 MCP.

APPENDIX 2

PROPOSED ACTION, NEVADA/UTAH FULL BASING WITH OB COMPLEXES NEAR COYOTE SPRING VALLEY, NEVADA AND MILFORD, UTAH.

LIST OF FIGURES

LIST OF TABLES

PROPOSED ACTION

Description

The Proposed Action calls for full basing deployment in the southern and east-central parts of the Nevada/Utah siting region, with the first OB complex located near Coyote Spring Valley, Nevada and a second OB complex near Milford, Utah.

Construction Scenario

The construction plan used in the analysis of the full basing system deployed in Nevada/Utah (Proposed Action) is shown in Figure 2-1. Six to ten concrete plants would be required in a total of 20 different locations. Colocated with these plants would be construction camps, marshalling yards/staging areas, and life support facilities. The exact locations for these plants/camps will be determined based primarily on the following criteria: water availability, aggregate availability, and minimum haul distances.

OB Complex Construction

A construction camp will be established at each of the two OB complexes. The major construction item originating from these two camps is building construction; such as concrete and concrete block structures, metal structures, and wood frame structures.

When the scheduling for the OB complexes was established, it was intended that construction would begin at the first OB complex in 1982 and would be complete in 1986. Construction of the second OB complex would begin in 1985 and end in 1989. There are studies in progress which may change this preliminary scheduling.

For the Proposed Action, the first OB complex is near Coyote Spring Valley, Nevada. Most of the construction in the first year will be concentrated in the DAA, OBTS, and at the airfield. A portion of the DTN connecting the DAA to the DDA will also be constructed from the camp in the OB complex. Construction in the OBTS and at the airfield should be completed by 1984, with the rest of the construction years devoted to the remainder of the DAA and the OB. All technical facilities at the first OB complex must be complete by the end of 1985 to meet IOC in 1986. Figure 2-2 shows the construction schedule for the first OB complex.

The second OB complex for the Proposed Action is near Milford, Utah. Since this complex does not have to be operational for IOC, construction will not be at as an accelerated rate as for the first OB. All construction activity will be at the OB and airfield, since there is no DAA or OBTS associated with the second OB complex. Figure 2-3 shows the construction schedule for the second OB complex.

DDA Construction

The key construction items originating from the DDA plants/camps are DTN roads, cluster roads, and protective shelters. The range of DTN road mileage constructed from any one plant/camp is between 50 and 150 mi. Between 100 and 500 mi of cluster roads can be constructed from a plant/camp. The number of

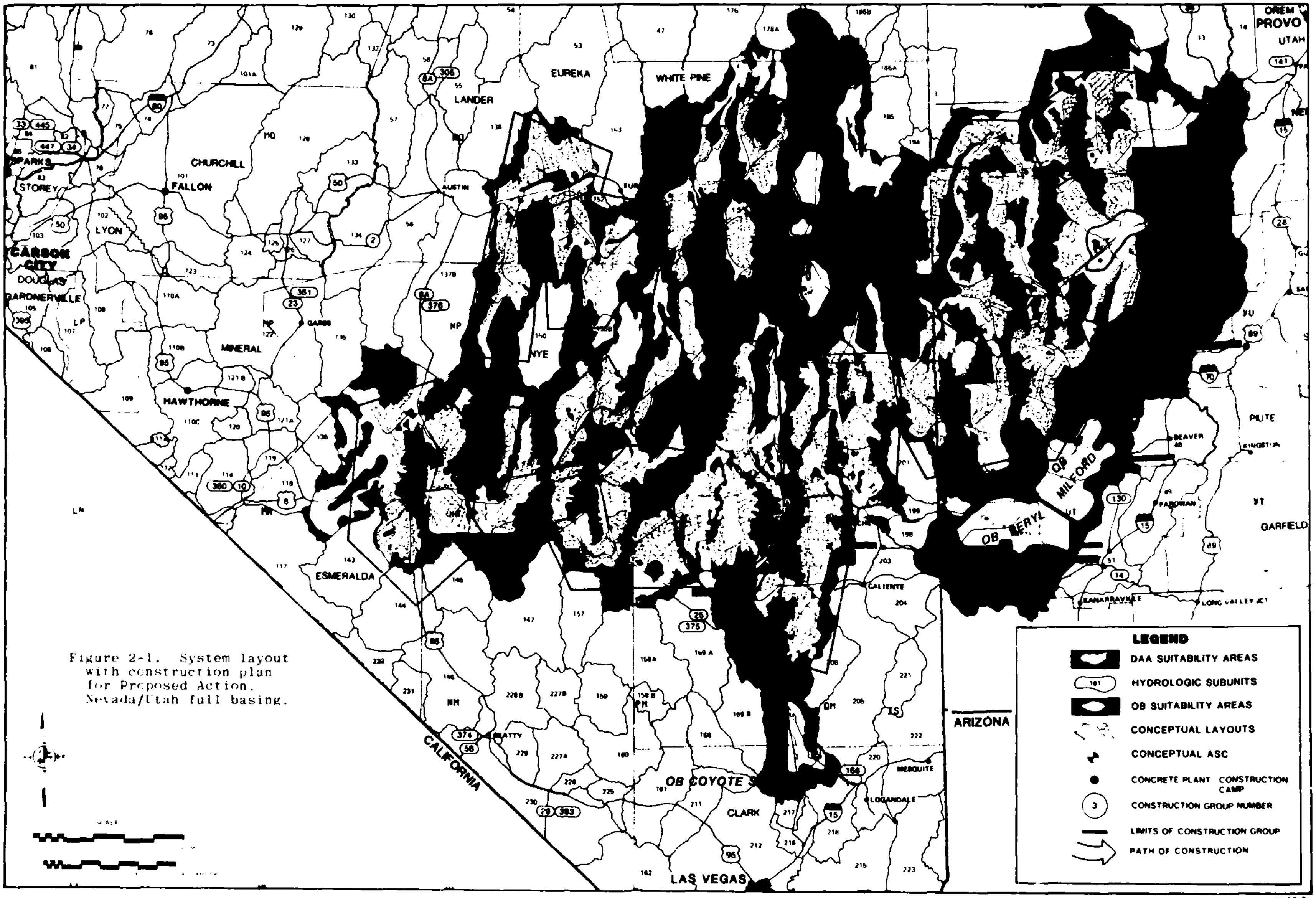

Figure 2-1. System layout with construction plan for Proposed Action, Nevada/Utah full basing.

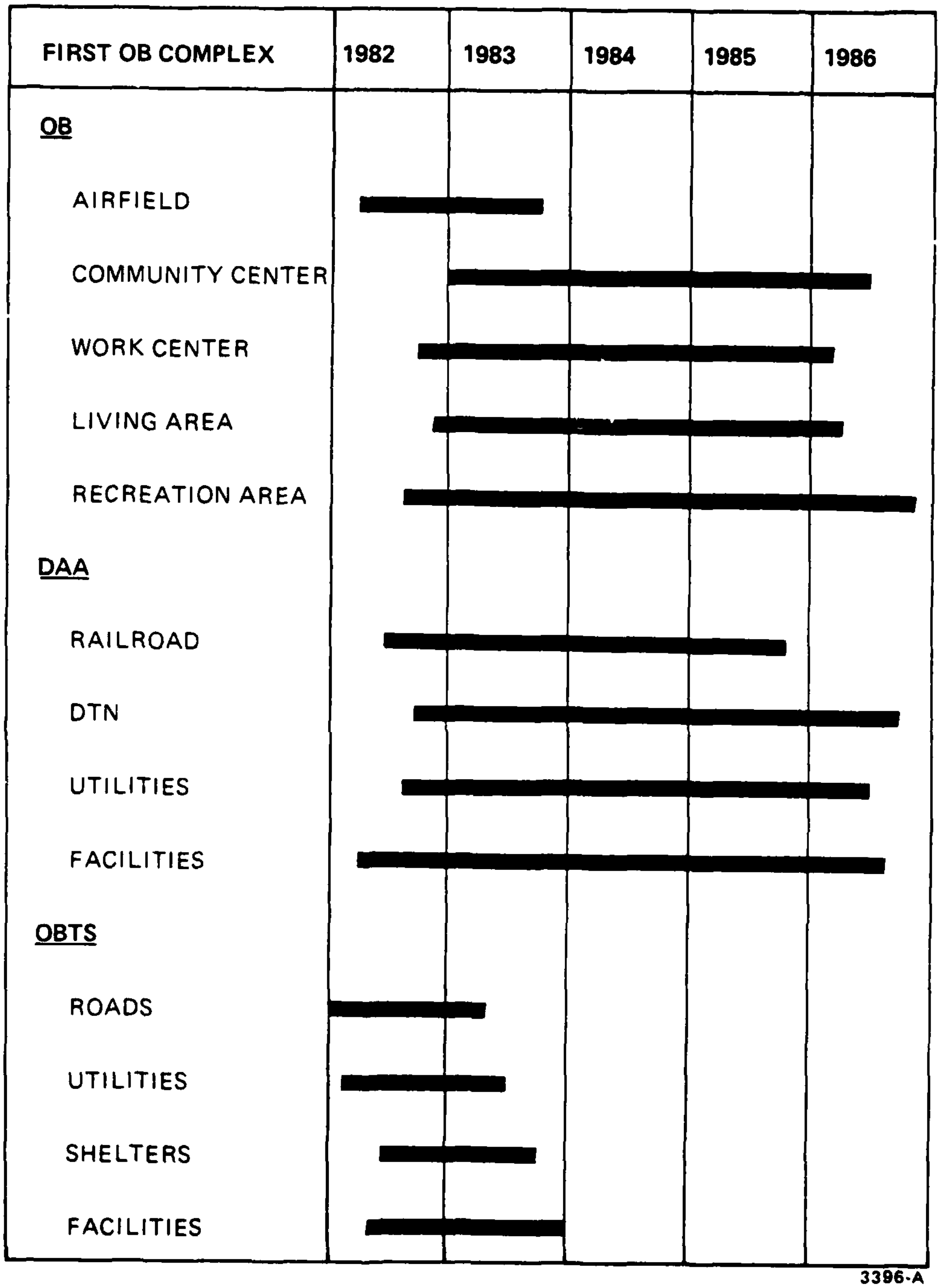

Figure 2-2. First OB complex construction schedule for Proposed Action, Nevada/Utah full basing.

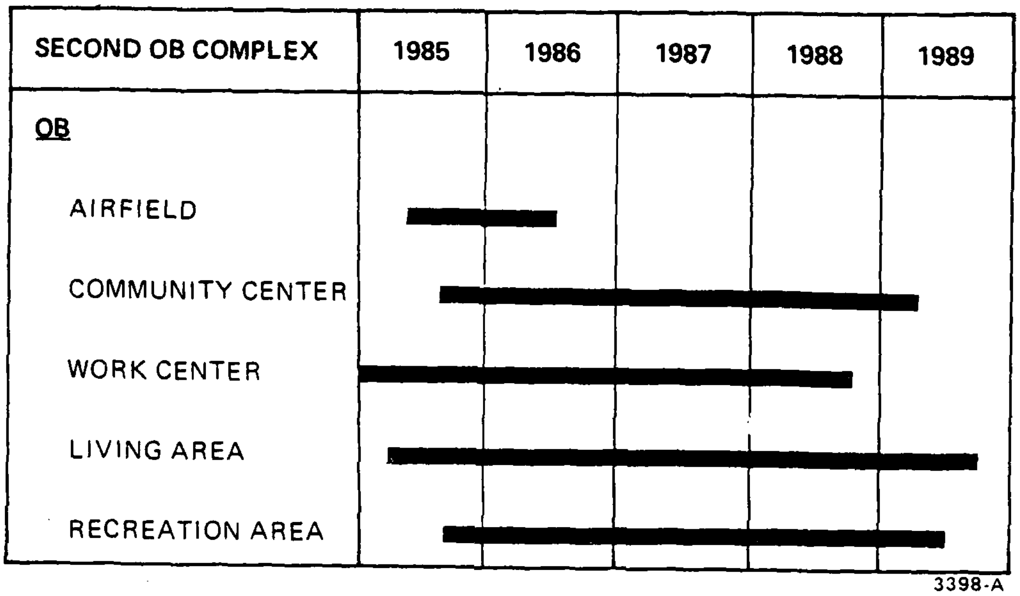

Figure 2-3. Second OB complex construction schedule for Proposed Action, Nevada/Utah full basing.

protective shelters built from a plant/camp ranges from 100 to 450. These construction ranges occur because no constant construction rates were used for each group.

Eighteen construction groups were established for scheduling purposes. Each group contains from 6 to 19 clusters. The construction groups were combined to form six general regions. To meet schedules and minimize the total personnel in any area at a given time, construction operations would be conducted concurrently in the six regions, as indicated by the construction path arrows. These construction operations will be pursued in accordance with the schedule shown in Figure 2-4.

Work would begin at Coyote Spring Valley, where the first OB complex construction terminates, then proceed north to Dry Lake and Delamar valleys, progress through Utah and Nevada, and end in Sand Springs Valley. By late 1984, construction would be occurring simultaneously in all six regions. Construction will peak in 1986. This sequence is planned to permit Intermountain Power Project (IPP) construction to sequentially follow local M-X construction and, thus, turn the cumulative impacts of both projects in the immediate region into a lower peak over a longer peri... An attempt has been made to integrate the M-X construction with planned majo. projects. Schedule changes for specific construction groups for the Proposed Action could be made.

Construction Resource Requirements

Table 2-1 shows the average direct personnel required for any given year. This table includes construction, assembly and checkout (A&CO), and operations personnel. The peak year for construction personnel occurs in 1986 with approximately 17,000 required. A&CO personnel requirements peak over a three-year span, 1986-1988, with approximately 6,000 people required in each of the years. The peak for operations personnel will occur at final operational capability (FOC) in 1989, and remain constant thereafter. This number will be approximately 13,000. Tables 2-2, 2-3, and 2-4 give a more detailed breakdown of construction, A&CO, and operations personnel requirements, respectively.

The total construction resources for the Proposed Action are shown in Table 2-5. Generally, the peak year requirement for most of the construction resources occurs in 1987. Except for personnel, incremental and cumulative quantities are shown for each resource. The personnel numbers represent average direct construction personnel only. No water for revegetation was included. The disturbed area includes OB complex, protective shelter, and road construction, but does not include the areas associated with temporary construction facilities, such as marshalling yards, water wells, aggregate pits, etc. Reinforcing steel and steel shapes comprise the total steel quantities. Quantities for aggregate include road construction only.

OB Complexes

Table 2-6 shows the total construction resources for both OB complexes. There is no peak year for all of the construction resources. This does not occur for several reasons. The two OB complexes are generally constructed during different years, with only the two middle years of the total eight-year span having a construction overlap. The two OB complexes are very different in size and makeup.

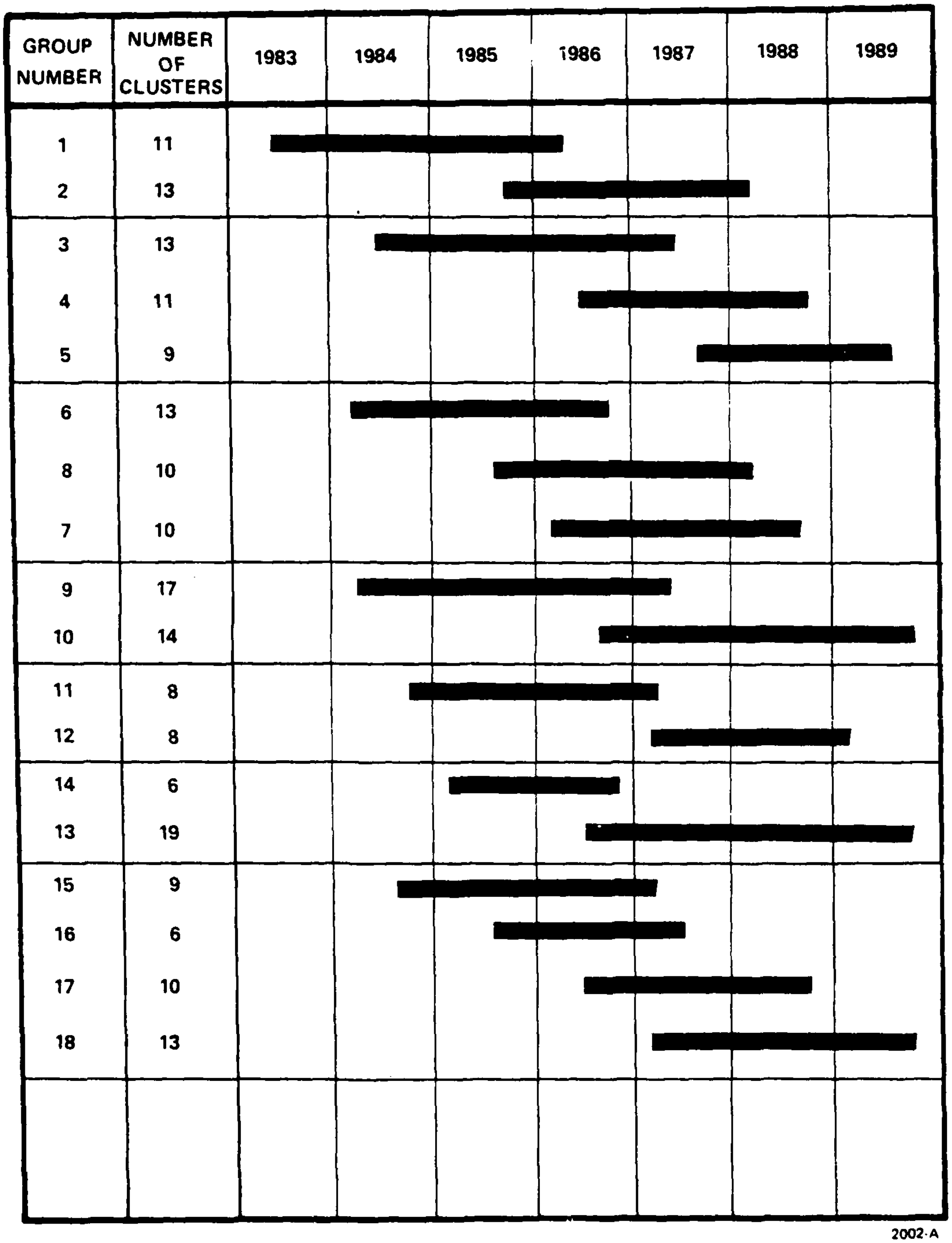

Figure 2-4. DDA construction schedule for Proposed Action, Nevada/Utah full basing.

Table 2-1. Average direct personnel requirements for Proposed Action, Nevada/Utah full basing.

DESCRIPTION	PERSONNEL									
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Construction										
DDA[1]		100	2,150	8,400	14,500	13,400	11,600	4,050		
First OB Complex[2]	1,150	1,900	2,300	2,000	1,200					
Second OB Complex[3]				400	1,350	2,050	1,450	750		
Subtotal	1,150	2,000	4,450	10,800	17,050	15,450	13,050	4,800		
A & CO										
DDA[1]		50	100	1,750	3,150	3,150	3,100	3,100	50	
First OB Complex[2]		350	900	1,800	2,850	2,850	2,800	2,650	50	
Second OB Complex[3]										
Subtotal		400	1,000	3,550	6,000	6,000	5,900	5,750	100	
Operations										
First OB Complex[2]			1,250	2,500	3,750	5,000	6,250	7,500	7,500	7,500
Second OB Complex[3]					1,400	2,800	4,250	5,700	5,700	5,700
Subtotal			1,250	2,000	5,150	7,800	10,500	13,200	13,200	13,200
TOTAL	1,150	2,400	6,700	16,850	28,200	29,250	29,450	23,750	13,300	13,200

2165-3

[1]Designated deployment area (DDA) includes protective shelters (PS), area support centers (ASC), designated transportation network (DTN), cluster maintenance facilities (CMF), remote surveillance sites (RSS), and cluster roads (CR).

[2]First OB complex includes operating base (OB), designated assembly area (DAA), operational base test site (OBTS), and airfield.

[3]Second OB complex includes OB and airfield.

Table 2-2. Average construction personnel requirements for Proposed Action, Nevada/Utah full basing.

GROUP NUMBER[1]	CONSTRUCTION PERSONNEL							
	1982	1983	1984	1985	1986	1987	1988	1989
1		100	950	1,600	250			
2				50	1,700	150		
3			200	1,350	1,650	350		
4					150	1,350	1,400	
5						150	1,300	1,050
6			550	1,800	1,200			
7					600	1,450	700	
8				150	1,150	1,350	50	
9			350	1,200	2,400	600		
10					100	1,000	2,000	700
11			50	750	1,250	50		
12						1,200	1,000	50
13					100	1,250	2,300	1,300
14				650	1,100			
15			50	750	1,450	250		
16				100	1,150	400		
17					250	1,550	950	
18						750	1,750	950
Subtotal		100	2,150	8,400	14,500	13,400	11,600	4,050
First OB Complex[2]	1,150	1,900	2,300	2,000	1,200			
Second OB Complex[3]				400	1,350	2,050	1,450	750
Total	1,150	2,000	4,450	10,800	17,050	15,450	13,050	4,800

2330-1

[1]See Figures 2-1 and 2-4.

[2]See Figure 2-2.

[3]See Figure 2-3.

Table 2-3. Average A&CO personnel requirements for Proposed Action, Nevada/Utah full basing.

GROUP NUMBER[1]	A & CO PERSONNEL							
	1983	1984	1985	1986	1987	1988	1989	1990
1	50	40	330	60				
2			10	360	400	30		
3		10	280	360	80			
4				30	320	380		
5					30	350	800	
6		20	370	260				
7				130	340	180		
8			30	250	320	20		
9		10	250	520	140			
10				20	230	540	550	
11		10	160	270	10			
12					280	260	30	50
13				30	300	620	1,000	
14			140	230				
15		10	160	320	60			
16			20	250	100			
17				60	360	250		
18					180	470	720	
Subtotal	50	100	1,750	3,150	3,150	3,100	3,100	50
First OB Complex[2] Second OB Complex[3]	350	900	1,800	2,850	2,850	2,800	2,650	50
Total	400	1,000	3,550	6,000	6,000	5,900	5,750	100

2331-1

[1] See Figures 2-1 and 2-4.

[2] See Figure 2-2.

[3] See Figure 2-3.

Table 2-4. Average operations personnel requirements for Proposed Action, Nevada/Utah full basing.

EMPLOYMENT TYPE	OPERATIONS PERSONNEL					
	1984	1985	1986	1987	1988	1989
First OB Complex						
Officer	100	200	300	400	500	600
Enlisted	950	1,925	2,900	3,850	4,800	5,750
Civilian	200	375	550	750	950	1,150
Subtotal	1,250	2,500	3,750	5,000	6,250	7,500
Second OB Complex						
Officer			100	200	350	450
Enlisted			1,100	2,200	3,250	4,400
Civilian			200	400	650	850
Subtotal			1,400	2,800	4,250	5,700
Total	1,250	2,500	5,150	7,800	10,500	13,200

2168-2

NOTE: Operations employment will continue at 1989 levels throughout the operating life of the project.

Table 2-5. Total construction resources for Proposed Action, Nevada/Utah full basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel	1,150	1,992	4,400	10,722	17,075	15,303	13,017	4,821
Water (AF)								
Incremental	380	890	6,133	18,376	20,669	23,075	14,295	3,207
Cumulative	380	1,270	7,403	25,779	46,448	69,523	83,818	87,025
Disturbed Area (Acres)								
Incremental	1,740	3,317	10,907	26,566	32,631	36,461	22,926	5,484
cumulative	1,740	5,057	15,964	42,530	75,161	111,622	134,548	140,032
Materials								
Steel (Tons)								
Incremental		850	3,539	30,112	121,399	82,982	107,242	50,068
Cumulative		850	4,389	34,501	155,900	238,882	346,124	396,192
Concrete (CY*1,000)								
Incremental		150	189	365	1,094	794	924	436
Cumulative		150	339	704	1,798	2,592	3,516	3,952
Asphalt (TNS*1,000)								
Incremental		121	1,491	1,836	1,979	2,035	397	100
Cumulative		121	1,612	3,448	5,427	7,462	7,859	7,959
Aggregate (CY*1,000)								
Incremental	140	363	3,659	11,921	10,395	13,630	6,988	649
Cumulative	140	503	4,162	16,083	26,478	40,108	47,096	47,745
Prime Coat (TNS)								
Incremental		444	6,725	7,816	7,898	8,864	2,438	850
Cumulative		444	7,169	14,985	22,883	31,747	34,185	35,035
Fencing (LF*1,000)								
Incremental			45	505	1,938	1,308	1,727	807
Cumulative			45	550	2,488	3,796	5,523	6,330

Personnel numbers are yearly averages. 3315-2

Table 2-6. Total OB complex construction resources for Proposed Action, Nevada/Utah full basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]	1,150	1,900	2,300	2,400	2,550	2,050	1,450	750
Water (AF)								
Incremental	380	620	750	820	940	800	570	280
Cumulative	380	1,000	1,750	2,570	3,510	4,310	4,880	5,160
Disturbed Area (Acres)								
Incremental	1,740	3,000	3,600	470	1,530	2,240		
cumulative	1,740	4,740	8,340	8,810	10,340	12,580		
Materials								
Steel (Tons)								
Incremental		850	1,000	880	990	720	500	250
Cumulative		850	1,850	2,730	3,720	4,440	4,940	5,190
Concrete (CY*1,000)								
Incremental		150	170	150	210	190	140	70
Cumulative		150	320	470	680	870	1,010	1,080
Asphalt (TNS*1,000)								
Incremental			280	240	150	240	170	100
Cumulative			280	520	670	910	1,080	1,180
Aggregate (CY*1,000)								
Incremental	140	220	260	290	330	290	210	100
Cumulative	140	360	620	910	1,240	1,530	1,740	1,840
Prime Coat (TNS)								
Incremental			2,300	1,980	1,210	2,300	1,610	850
Cumulative			2,300	4,280	5,490	7,790	9,400	10,250
Fencing (LF*1,000)								
Incremental			5	40	23	0	29	15
Cumulative			5	45	68	68	97	112

[1]Personnel numbers are yearly averages.

3311-2

DDA

The total resource requirements associated with construction of the DDA for the Proposed Action are shown in Table 2-7. Incremental and cumulative quantities are shown for each item except personnel. Water quantities are for concrete, dust suppression, compaction, and construction personnel use. It does not include water required for revegetation. The disturbed areas are the result of construction of protective shelters and roads. Disturbed areas associated with construction of temporary facilities, such as marshalling yards, wells, aggregate pits, etc., are not included. The steel quantities presented include both reinforcing and plate steel. The quantities shown for aggregate are for road construction only. Table 2-8 is identical to Table 2-7 except that it shows the construction resources required for each construction group.

Table 2-7. Total DDA construction resources for Proposed Action, Nevada/Utah full basing.

QUANTITY PER YEAR							
CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
Personnel [1]	92	2,100	8,322	14,525	13,252	11,567	4,071
Water (AF)							
Incremental	270	5,383	17,556	19,729	22,275	13,725	2,927
Cumulative	270	5,653	23,209	42,937	65,212	78,938	81,865
Disturbed Area (Acres)							
Incremental	317	7,307	26,096	31,101	34,221	22,926	5,484
Cumulative	317	7,624	33,720		99,042	121,968	127,452
Steel (TNS)							
Incremental		2,539	29,232	120,409	182,262	106,742	49,818
Cumulative		2,539	31,770	152,179	234,441	341,182	391,000
Concrete (CY 1,000)							
Incremental		19	215	884	604	784	366
Cumulative		19	233	1,117	1,721	2,505	2,870
Asphalt (TNS 1,000)							
Incremental	121	1,211	1,596	1,829	1,795	227	
Cumulative	121	1,332	2,928	4,758	6,553	6,780	
Aggregate (CY 1,000)							
Incremental	143	3,399	11,631	10,065	13,340	6,778	549
Cumulative	143	3,542	15,173	25,238	38,578	45,356	45,905
Prime Coat (TNS)							
Incremental	444	4,425	5,836	6,688	6,564	820	
Cumulative	444	4,870	10,706	17,394	23,958		
Fencing (LF (1,000)							
Incremental		40	465	1,915	1,308	1,698	792
Cumulative		40	505	2,421	3,729	5,427	6,219
Protective Shelters							
Incremental		30	344	1,417	968	1,256	586
Cumulative		30	374	1,790	2,758	4,014	4,600
Miles of DTN Roads							
Incremental	26	260	343	393	386	49	
Cumulative	26	286	630	1,023	1,409	1,458	
Miles of Cluster Roads							
Incremental		323	1,594	1,294	1,335	1,064	90
Cumulative		323	1,917	3,211	5,046	6,110	6,200

[1] Personnel numbers are yearly averages.

4004-2

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING.

GROUP 1
(PAGE 1 OF 18)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL [1]	92	941	1589	273			
WATER (AF)							
INCREMENTAL	270	2096	1768	159			
CUMULATIVE	270	2366	4134	4294			
DISTURBED AREA (ACRES)							
INCREMENTAL	317	3122	3010	316			
CUMULATIVE	317	3439	6449	6765			
MATERIALS							
STEEL (TNS)							
INCREMENTAL		2539	15382	3584			
CUMULATIVE		2539	17921	21505			
CONCRETE(CY*1000)							
INCREMENTAL		19	113	26			
CUMULATIVE		19	132	158			
ASPHALT(TNS*1000)							
INCREMENTAL	121	158					
CUMULATIVE	121	279					
AGGREGATE(CY*1000)							
INCREMENTAL	143	1439	833				
CUMULATIVE	143	1581	2415				
PRIMECOAT(TNS)							
INCREMENTAL	444	576					
CUMULATIVE	444	1020					
FENCING(LF*1000)							
INCREMENTAL		40	245	57			
CUMULATIVE		40	285	342			
PROTECTIVE SHELTERS							
INCREMENTAL		30	181	42			
CUMULATIVE		30	211	253			
MILES OF DTN ROADS							
INCREMENTAL	26	34					
CUMULATIVE	26	60					
MILES OF CLUSTER RD							
INCREMENTAL		205	136				
CUMULATIVE		205	341				

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION,
NEVADA/UTAH FULL BASING.
QUANTITY PER YEAR

GROUP 2
(PAGE 2 OF 18)

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]			32	1681	1699	122	
WATER (AF)							
INCREMENTAL			95	3125	2115	71	
CUMULATIVE			95	3220	5335	5406	
DISTURBED AREA (ACRES)							
INCREMENTAL			112	4663	3468	142	
CUMULATIVE			112	4775	8243	8384	
MATERIALS							
STEEL (TNS)							
INCREMENTAL				8696	15114	1604	
CUMULATIVE				8696	23811	25415	
CONCRETE (CY*1000)							
INCREMENTAL				64	111	12	
CUMULATIVE				64	175	187	
ASPHALT (TNS*1000)							
INCREMENTAL			43	354	83		
CUMULATIVE			43	396	479		
AGGREGATE (CY*1000)							
INCREMENTAL			50	1914	1064		
CUMULATIVE			50	1964	3029		
PRIMECOAT (TNS)							
INCREMENTAL			156	1292	302		
CUMULATIVE			156	1449	1751		
FENCING (LF*1000)							
INCREMENTAL				138	240	26	
CUMULATIVE				138	378	404	
PROTECTIVE SHELTERS							
INCREMENTAL				102	178	19	
CUMULATIVE				102	280	299	
MILES OF DTN ROADS							
INCREMENTAL				76	18		
CUMULATIVE				85	103		
MILES OF CLUSTER RD							
INCREMENTAL				245	158		
CUMULATIVE				245	403		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING. QUANTITY PER YEAR

GROUP 3
(PAGE 3 OF 18)

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]		165	1354	1649	334		
WATER (AF)							
INCREMENTAL		486	3229	1403	195		
CUMULATIVE		486	3715	5118	5313		
DISTURBED AREA (ACRES)							
INCREMENTAL		570	4794	2523	387		
CUMULATIVE		570	5365	7888	8275		
MATERIALS							
STEEL(TNS)							
INCREMENTAL			2269	18759	4387		
CUMULATIVE			2269	21028	25415		
CONCRETE(CY*1000)							
INCREMENTAL			17	138	32		
CUMULATIVE			17	154	187		
ASPHALT(TNS*1000)							
INCREMENTAL		219	219				
CUMULATIVE		219	438				
AGGREGATE(CY*1000)							
INCREMENTAL		257	2285	438			
CUMULATIVE		257	2542	2980			
PRIMECOAT(TNS)							
INCREMENTAL		799	799				
CUMULATIVE		799	1598				
FENCING(LF*1000)							
INCREMENTAL			36	298	70		
CUMULATIVE			36	334	404		
PROTECTIVE SHELTERS							
INCREMENTAL			26	221	52		
CUMULATIVE			26	247	299		
MILES OF DTN ROADS							
INCREMENTAL		47	47				
CUMULATIVE		47	94				
MILES OF CLUSTER RD							
INCREMENTAL			329	72			
CUMULATIVE			329	401			

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING
QUANTITY PER YEAR

GROUP 4
(PAGE 4 OF 18)

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]				152.	1355.	1405.	
WATER (AF)							
INCREMENTAL				447.	2748	1151.	
CUMULATIVE				447.	3195	4345	
DISTURBED AREA (ACRES)							
INCREMENTAL				524.	4213.	2088.	
CUMULATIVE				524.	4738	6826.	
MATERIALS							
STEEL(TNS)							
INCREMENTAL					5218.	16287.	
CUMULATIVE					5218.	21505.	
CONCRETE(CY*1000)							
INCREMENTAL					38	120.	
CUMULATIVE					38.	158.	
ASPHALT(TNS*1000)							
INCREMENTAL				201.	101.		
CUMULATIVE				201.	302.		
AGGREGATE(CY*1000)							
INCREMENTAL				236.	1878.	328.	
CUMULATIVE				236.	2114.	2442.	
PRIMECOAT(TNS)							
INCREMENTAL				734.	371.		
CUMULATIVE				734.	1105.		
FENCING(LF*1000)							
INCREMENTAL					83	259.	
CUMULATIVE					83.	342	
PROTECTIVE SHELTERS							
INCREMENTAL					61.	192	
CUMULATIVE					61	253.	
MILES OF DTN ROADS							
INCREMENTAL				43	22		
CUMULATIVE				43	65		
MILES OF CLUSTER RD							
INCREMENTAL					287.	54	
CUMULATIVE					287	341	

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING

GROUP 5

(PAGE 5 OF 18)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL [1]					130.	1313	1054.
WATER (AF)							
INCREMENTAL					407.	2770.	739.
CUMULATIVE					407.	3177.	3916.
DISTURBED AREA (ACRES)							
INCREMENTAL					477.	4137.	1394.
CUMULATIVE					477.	4613.	6007.
MATERIALS							
STEEL (TNS)							
INCREMENTAL						4568.	13027.
CUMULATIVE						4568.	17595.
CONCRETE (CY*1000)							
INCREMENTAL						34.	96.
CUMULATIVE						34.	129.
ASPHALT (TNS*1000)							
INCREMENTAL					183.	227.	
CUMULATIVE					183.	407.	
AGGREGATE (CY*1000)							
INCREMENTAL					215.	1850.	123.
CUMULATIVE					215.	2065.	2188.
PRIMECOAT (TNS)							
INCREMENTAL					668.	828.	
CUMULATIVE					668.	1496.	
FENCING (LF*1000)							
INCREMENTAL						73.	207.
CUMULATIVE						73.	280.
PROTECTIVE SHELTERS							
INCREMENTAL						54.	153.
CUMULATIVE						54.	207.
MILES OF DTN ROADS							
INCREMENTAL					39.	49.	
CUMULATIVE					39.	88.	
MILES OF CLUSTER RD							
INCREMENTAL						259.	20.
CUMULATIVE						259.	279.

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING.

GROUP 6
(PAGE 6 OF 18)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]		569.	1700.	1203.			
WATER (AF)							
INCREMENTAL		1566.	3171.	701.			
CUMULATIVE		1566	4757.	5458.			
DISTURBED AREA (ACRES)							
INCREMENTAL		2122.	4929.	1393.			
CUMULATIVE		2122.	7052.	8445.			
MATERIALS							
STEEL(TNS)							
INCREMENTAL			9625.	15790.			
CUMULATIVE			9625.	25415.			
CONCRETE(CY*1000)							
INCREMENTAL			71.	116.			
CUMULATIVE			71.	187.			
ASPHALT(TNS*1000)							
INCREMENTAL		338.	165.				
CUMULATIVE		338.	502.				
AGGREGATE(CY*1000)							
INCREMENTAL		1022.	2034.				
CUMULATIVE		1022.	3056.				
PRIMECOAT(TNS)							
INCREMENTAL		1234.	602.				
CUMULATIVE		1234.	1836.				
FENCING(LF*1000)							
INCREMENTAL			153	251.			
CUMULATIVE			153.	404.			
PROTECTIVE SHELTERS							
INCREMENTAL			113.	186.			
CUMULATIVE			113	299.			
MILES OF DTN ROADS							
INCREMENTAL		73	35.				
CUMULATIVE		73.	108				
MILES OF CLUSTER RD							
INCREMENTAL		102	301				
CUMULATIVE		102.	403				

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING.

GROUP 7
(PAGE 7 OF 18)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL				620	1427.	677	
WATER (AF)							
INCREMENTAL				1711	2080	396	
CUMULATIVE				1711	3792	4187	
DISTURBED AREA (ACRES)							
INCREMENTAL				2309	3387.	787.	
CUMULATIVE				2309.	5696.	6483.	
MATERIALS							
STEEL (TNS)							
INCREMENTAL					10635.	8715.	
CUMULATIVE					10635.	19550.	
CONCRETE(CY*1000)							
INCREMENTAL					78.	65.	
CUMULATIVE					78.	144.	
ASPHALT(TNS*1000)							
INCREMENTAL				381			
CUMULATIVE				381.			
AGGREGATE(CY*1000)							
INCREMENTAL				1110.	1235.		
CUMULATIVE				1110.	2345.		
PRIMECOAT(TNS)							
INCREMENTAL				1394			
CUMULATIVE				1394.			
FENCING(LF*1000)							
INCREMENTAL					169.	142	
CUMULATIVE					169.	311	
PROTECTIVE SHELTERS							
INCREMENTAL					125	105	
CUMULATIVE					125	230.	
MILES OF DTN ROADS							
INCREMENTAL				82			
CUMULATIVE				82			
MILES OF CLUSTER RD							
INCREMENTAL				108	202		
CUMULATIVE				108	310		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION
NEVADA/UTAH FULL BASING

GROUP 8
(PAGE 8 OF 18)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]			153	1145	1363.	67	
WATER (AF)							
INCREMENTAL			450.	2698	1001.	37.	
CUMULATIVE			450	3147	4148.	4187.	
DISTURBED AREA (ACRES)							
INCREMENTAL			527.	4013.	1865.	78.	
CUMULATIVE			527	4540.	6405.	6483.	
MATERIALS							
STEEL(TNS)							
INCREMENTAL				2125.	16540.	885	
CUMULATIVE				2125.	18665.	19550.	
CONCRETE(CY*1000)							
INCREMENTAL				16.	121.	7.	
CUMULATIVE				16.	137.	144.	
ASPHALT(TNS*1000)							
INCREMENTAL			202	179.			
CUMULATIVE			202.	381.			
AGGREGATE(CY*1000)							
INCREMENTAL			237.	1903.	204.		
CUMULATIVE			237.	2140.	2345.		
PRIMECOAT(TNS)							
INCREMENTAL			738.	656.			
CUMULATIVE			738	1394.			
FENCING(LF*1000)							
INCREMENTAL				34.	263	14	
CUMULATIVE				34	297	311.	
PROTECTIVE SHELTERS							
INCREMENTAL				25	195	10	
CUMULATIVE				25	220	230.	
MILES OF DTN ROADS							
INCREMENTAL			43	39			
CUMULATIVE			43	82			
MILES OF CLUSTER RD							
INCREMENTAL				277	33		
CUMULATIVE				277	310		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING

GROUP 9
(PAGE 9 OF 18)

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
	QUANTITY PER YEAR						
PERSONNEL[1]		344.	1185	2396.	575.		
WATER (AF)							
INCREMENTAL		994.	3101	2280.	335		
CUMULATIVE		994.	4095.	6376.	6711.		
DISTURBED AREA (ACRES)							
INCREMENTAL		1210	4664.	4002	666.		
CUMULATIVE		1210	5875.	9877.	10543.		
MATERIALS							
STEEL(TNS)							
INCREMENTAL				25687.	7548.		
CUMULATIVE				25687	33235.		
CONCRETE(CY*1000)							
INCREMENTAL				189	55.		
CUMULATIVE				189.	244.		
ASPHALT(TNS*1000)							
INCREMENTAL		389	76				
CUMULATIVE		389	465				
AGGREGATE(CY*1000)							
INCREMENTAL		555.	2341	875			
CUMULATIVE		555	2896	3771			
PRIMECOAT(TNS)							
INCREMENTAL		1422	278				
CUMULATIVE		1422	1700				
FENCING(LF*1000)							
INCREMENTAL				409	120.		
CUMULATIVE				409	529		
PROTECTIVE SHELTERS							
INCREMENTAL				302	89		
CUMULATIVE				302	391		
MILES OF DTN ROADS							
INCREMENTAL		84	16				
CUMULATIVE		84	100				
MILES OF CLUSTER RD							
INCREMENTAL		16	368	143			
CUMULATIVE		16	384	527			

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING

GROUP 10

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL				80	957	2007	717
WATER (AF)							
INCREMENTAL				235	2578	2457	418
CUMULATIVE				235	2813	5271	5689
DISTURBED AREA (ACRES)							
INCREMENTAL				276	3654	4113	830
CUMULATIVE				276	3930	8042	8872
MATERIALS							
STEEL (TNS)							
INCREMENTAL						17962	9408
CUMULATIVE						17962	27370
CONCRETE (CY*1000)							
INCREMENTAL						132	69
CUMULATIVE						132	201
ASPHALT (TNS*1000)							
INCREMENTAL				106	350		
CUMULATIVE				106	456		
AGGREGATE (CY*1000)							
INCREMENTAL				124	1792	1274	
CUMULATIVE				124	1917	3191	
PRIMECOAT (TNS)							
INCREMENTAL				387	1279		
CUMULATIVE				387	1666		
FENCING (LF*1000)							
INCREMENTAL						286	150
CUMULATIVE						286	435
PROTECTIVE SHELTERS							
INCREMENTAL						211	111
CUMULATIVE						211	322
MILES OF DTN ROADS							
INCREMENTAL				23	75		
CUMULATIVE				23	98		
MILES OF CLUSTER RD							
INCREMENTAL					226	208	
CUMULATIVE					226	434	

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING

GROUP 11

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL [1]		42	764	1262	43		
WATER (AF)							
INCREMENTAL		124	1726	1262	25		
CUMULATIVE		124	1850	3112	3137		
DISTURBED AREA (ACRES)							
INCREMENTAL		145	2549	2193	49		
CUMULATIVE		145	2694	4887	4936		
MATERIALS							
STEEL(TNS)							
INCREMENTAL			1955	13126	559		
CUMULATIVE			1955	15081	15640		
CONCRETE(CY*1000)							
INCREMENTAL			14	96	4		
CUMULATIVE			14	111	115		
ASPHALT(TNS*1000)							
INCREMENTAL		56	154				
CUMULATIVE		56	209				
AGGREGATE(CY*1000)							
INCREMENTAL		65	1176	522			
CUMULATIVE		65	1242	1763			
PRIMECOAT(TNS)							
INCREMENTAL		203	562				
CUMULATIVE		203	765				
FENCING(LF*1000)							
INCREMENTAL			31	209	7		
CUMULATIVE			31	240	247		
PROTECTIVE SHELTERS							
INCREMENTAL			23	154	7		
CUMULATIVE			23	177	184		
MILES OF DTN ROADS							
INCREMENTAL		12	30				
CUMULATIVE		12	42				
MILES OF CLUSTER RD							
INCREMENTAL			153	95			
CUMULATIVE			153	248			

[1] PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING.

GROUP 12
(PAGE 12 OF 18)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]					1182.	760.	41.
WATER (AF)							
INCREMENTAL					2786.	564.	24.
CUMULATIVE					2786.	3351.	3375.
DISTURBED AREA (ACRES)							
INCREMENTAL					4046.	1121.	48.
CUMULATIVE					4046.	5168.	5216.
MATERIALS							
STEEL(TNS)							
INCREMENTAL					2389.	12708.	543.
CUMULATIVE					2389.	15097.	15640.
CONCRETE(CY*1000)							
INCREMENTAL					18.	93.	4.
CUMULATIVE					18	111.	115.
ASPHALT(TNS*1000)							
INCREMENTAL					316.		
CUMULATIVE					316.		
AGGREGATE(CY*1000)							
INCREMENTAL					1889.		
CUMULATIVE					1889		
PRIMECOAT(TNS)							
INCREMENTAL					1156.		
CUMULATIVE					1156.		
FENCING(LF*1000)							
INCREMENTAL					38	202	9
CUMULATIVE					38.	240.	249
PROTECTIVE SHELTERS							
INCREMENTAL					28	150	6
CUMULATIVE					28	178	184
MILES OF DTN ROADS							
INCREMENTAL					68		
CUMULATIVE					68		
MILES OF CLUSTER RD							
INCREMENTAL					240		
CUMULATIVE					240		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING.

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]				115	1237.	2327	1320
WATER (AF)							
INCREMENTAL				340.	2676.	3195.	1199
CUMULATIVE				340.	3015.	6210.	7410.
DISTURBED AREA (ACRES)							
INCREMENTAL				398.	3905	5247	2125
CUMULATIVE				398	4303	9551.	11677.
MATERIALS							
STEEL(TNS)							
INCREMENTAL					4054.	18573.	14519.
CUMULATIVE					4054.	22626.	37145.
CONCRETE(CY*1000)							
INCREMENTAL					30.	136.	107.
CUMULATIVE					30.	166	273.
ASPHALT(TNS*1000)							
INCREMENTAL				153	326		
CUMULATIVE				153	479.		
AGGREGATE(CY*1000)							
INCREMENTAL				179.	1742.	1820	426.
CUMULATIVE				179.	1921	3741	4167
PRIMECOAT(TNS)							
INCREMENTAL				558	1193		
CUMULATIVE				558	1751		
FENCING(LF*1000)							
INCREMENTAL					64	275	231
CUMULATIVE					64	360	591
PROTECTIVE SHELTERS							
INCREMENTAL					48	219	171
CUMULATIVE					48	266	437
MILES OF DTN ROADS							
INCREMENTAL				33.	70		
CUMULATIVE				33	103		
MILES OF CLUSTER RD							
INCREMENTAL					222	297	70
CUMULATIVE					222	519	589

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING.

GROUP 14
(PAGE 14 OF 18)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL [1]			639	1085			
WATER (AF)							
INCREMENTAL			1751	1018			
CUMULATIVE			1751	2769			
DISTURBED AREA (ACRES)							
INCREMENTAL			2398	1793			
CUMULATIVE			2398	4191			
MATERIALS							
STEEL (TNS)							
INCREMENTAL				11720			
CUMULATIVE				11730			
CONCRETE(CY*1000)							
INCREMENTAL				86			
CUMULATIVE				86			
ASPHALT(TNS*1000)							
INCREMENTAL			344				
CUMULATIVE			344				
AGGREGATE(CY*1000)							
INCREMENTAL			1160	382			
CUMULATIVE			1160	1542			
PRIMECOAT(TNS)							
INCREMENTAL			1258				
CUMULATIVE			1258				
FENCING(LF*1000)							
INCREMENTAL				187			
CUMULATIVE				187			
PROTECTIVE SHELTERS							
INCREMENTAL				138			
CUMULATIVE				138			
MILES OF DTN ROADS							
INCREMENTAL			74				
CUMULATIVE			74				
MILES OF CLUSTER RD							
INCREMENTAL			124	62			
CUMULATIVE			124	186			

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING.

GROUP 15
(PAGE 15 OF 18)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL [1]		40	740	1439	231		
WATER (AF)							
INCREMENTAL		116	1996	1503	135		
CUMULATIVE		116	2112	3615	3750		
DISTURBED AREA (ACRES)							
INCREMENTAL		137	2819	2589	268		
CUMULATIVE		137	2956	5545	5813		
MATERIALS							
STEEL(TNS)							
INCREMENTAL				14558	3037		
CUMULATIVE				14558	17595		
CONCRETE(CY*1000)							
INCREMENTAL				107	22		
CUMULATIVE				107	129		
ASPHALT(TNS*1000)							
INCREMENTAL		52	282				
CUMULATIVE		52	335				
AGGREGATE(CY*1000)							
INCREMENTAL		61	1381	658			
CUMULATIVE		61	1443	2101			
PRIMECOAT(TNS)							
INCREMENTAL		191	1033				
CUMULATIVE		191	1224				
FENCING(LF*1000)							
INCREMENTAL				232	48		
CUMULATIVE				232	280		
PROTECTIVE SHELTERS							
INCREMENTAL				171	36		
CUMULATIVE				171	207		
MILES OF DTN ROADS							
INCREMENTAL		11	61				
CUMULATIVE		11	72				
MILES OF CLUSTER RD							
INCREMENTAL			172	107			
CUMULATIVE			172	279			

[1] PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TAB.E 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING.

GROUP 16
(PAGE 16 OF 18)

CONSTRUCTION RESOURCES	QUANTITY PER YEAR						
	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]			85.	1167.	410.		
WATER (AF)							
INCREMENTAL			250.	2095.	239.		
CUMULATIVE			250.	2344.	2583		
DISTURBED AREA (ACRES)							
INCREMENTAL			293.	3205.	474.		
CUMULATIVE			293.	3498.	3972.		
MATERIALS							
STEEL(TNS)							
INCREMENTAL				6354.	5376.		
CUMULATIVE				6354.	11730.		
CONCRETE(CY*1000)							
INCREMENTAL				47.	39.		
CUMULATIVE				47.	86.		
ASPHALT(TNS*1000)							
INCREMENTAL			112	148.			
CUMULATIVE			112	260.			
AGGREGATE(CY*1000)							
INCREMENTAL			132.	1312.			
CUMULATIVE			132	1444.			
PRIMECOAT(TNS)							
INCREMENTAL			410	542.			
CUMULATIVE			410.	952.			
FENCING(LF*1000)							
INCREMENTAL				101	86		
CUMULATIVE				101	187		
PROTECTIVE SHELTERS							
INCREMENTAL				75	63		
CUMULATIVE				75.	138		
MILES OF DTN ROADS							
INCREMENTAL			24	32			
CUMULATIVE			24	56			
MILES OF CLUSTER RD							
INCREMENTAL				106			
CUMULATIVE				106			

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING.

GROUP 17
(PAGE 17 OF 18)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL [1]				258	1538	925	
WATER (AF)							
INCREMENTAL				751	2877	539	
CUMULATIVE				751	3627	4167	
DISTURBED AREA (ACRES)							
INCREMENTAL				903	4484	1072	
CUMULATIVE				903	5387	6459	
MATERIALS							
STEEL (TNS)							
INCREMENTAL					7404	12146	
CUMULATIVE					7404	19550	
CONCRETE(CY*1000)							
INCREMENTAL					54	89	
CUMULATIVE					54	144	
ASPHALT(TNS*1000)							
INCREMENTAL				308	64		
CUMULATIVE				308	372		
AGGREGATE(CY*1000)							
INCREMENTAL				412	1922		
CUMULATIVE				412	2334		
PRIMECOAT(TNS)							
INCREMENTAL				1125	235		
CUMULATIVE				1125	1360		
FENCING(LF*1000)							
INCREMENTAL					118	193	
CUMULATIVE					118	311	
PROTECTIVE SHELTERS							
INCREMENTAL					87	143	
CUMULATIVE					87	230	
MILES OF DTN ROADS							
INCREMENTAL				66	14		
CUMULATIVE				66	80		
MILES OF CLUSTER RD							
INCREMENTAL				8	302		
CUMULATIVE				8	310		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 2-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PROPOSED ACTION, NEVADA/UTAH FULL BASING.

GROUP 18
(PAGE 18 OF 18)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]					763.	1752.	939.
WATER (AF)							
INCREMENTAL					2080.	2542	547.
CUMULATIVE					2080.	4621	5168.
DISTURBED AREA (ACRES)							
INCREMENTAL					2877.	4141.	1087.
CUMULATIVE					2877.	7018	8105.
MATERIALS							
STEEL(TNS)							
INCREMENTAL						13095.	12320.
CUMULATIVE						13095.	25415.
CONCRETE(CY*1000)							
INCREMENTAL						96.	90.
CUMULATIVE						96	187.
ASPHALT(TNS*1000)							
INCREMENTAL					372		
CUMULATIVE					372.		
AGGREGATE(CY*1000)							
INCREMENTAL					1398	1505.	
CUMULATIVE					1398	2903	
PRIMECOAT(TNS)							
INCREMENTAL					1360		
CUMULATIVE					1360		
FENCING(LF*1000)							
INCREMENTAL					0	208	196
CUMULATIVE					0	208	404
PROTECTIVE SHELTERS							
INCREMENTAL						154	145
CUMULATIVE						154	299
MILES OF DTN ROADS							
INCREMENTAL					80		
CUMULATIVE					80		
MILES OF CLUSTER RD							
INCREMENTAL					157	246	
CUMULATIVE					157	403	

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

APPENDIX 3

ALTERNATIVES 1 THROUGH 6, NEVADA/UTAH FULL BASING WITH OB COMPLEXES AT VARIOUS LOCATIONS.

ALTERNATIVES 1 THROUGH 6

Description

These alternatives use the same basic DDA layout as the Proposed Action, but different OB complex locations. Alternative 1 has the first OB complex near Coyote Spring Valley, Nevada, and the second OB complex near Beryl, Utah. Alternative 2 also has the first OB complex near Coyote Spring Valley, Nevada, but the second OB complex is near Delta, Utah. The first OB complex is located near Beryl, Utah, for both Alternatives 3 and 4. The second OB complex is located near Ely, Nevada for Alternative 3, and near Coyote Spring Valley, Nevada for Alternative 4. Alternatives 5 and 6 have the first OB complex located near Milford, Utah. The second OB complex is near Ely, Nevada for Alternative 5, and near Coyote Spring Valley, Nevada for Alternative 6.

Construction Scenario

The construction plan used for Alternatives 1 through 6 is almost identical to the plan for the Proposed Action, as shown in Figure 2-1 of Appendix 2. The same number of concrete plants, construction camps, marshalling yards/staging areas, and life support facilities are required. Minor adjustments are needed because of the alternate OB complex locations.

OB Complex Construction

The construction scenario described in Appendix 2 for the OB complexes for the Proposed Action is also valid for Alternatives 1 through 6. The only variation is the location for each of the OB complexes.

DDA Construction

Since the DDA is identical for the Proposed Action and Alternatives 1 through 6, there is no significant change to the construction plan for the DDA. Selection of different clusters for IOC could revise the construction schedule shown in Figure 2-4 of Appendix 2.

Construction Resource Requirements

Table 2-1 through 2-8 of Appendix 2 apply to Alternatives 1 through 6, as well as the Proposed Action. See Appendix 2 for the discussion of the construction resource requirements for the Proposed Action.

APPENDIX 4

ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING WITH OB COMPLEXES NEAR CLOVIS, NEW MEXICO AND DALHART, TEXAS.

LIST OF FIGURES

LIST OF TABLES

ALTERNATIVE 7

Description

Alternative 7, full basing deployment in Texas/New Mexico, has the first OB complex near Clovis, New Mexico, and the second OB complex near Dalhart, Texas.

Construction Scenario

The construction plan used in the analysis of the full basing deployment in Texas/New Mexico (Alternative 7) with operating base complexes near Clovis, New Mexico and Dalhart, Texas is shown in Figure 4-1. It is estimated that between four and seven concrete plants would be required in a total of 16 different locations. Construction camps would be colocated with the concrete plants. Water availability, aggregate availability, and minimum haul distances will be the final determining factors in the exact locations for these plants/camps.

OB Complex Construction

The need for construction camps at the OB complexes for the full basing deployment in Texas/New Mexico is not the same as in the Nevada/Utah region. The first OB complex near Clovis will require a construction camp, but the second OB complex near Dalhart will not. The proximity of the DDA and its construction camp in construction group number 11 (see Figure 4-1) to the second OB complex will allow the construction camp to be used for both the DDA and the OB complex.

The construction scheduling for the OB complexes was identical to that for the Proposed Action. The first OB complex near Clovis, would be constructed between 1982 and 1986. Construction of the second OB complex near Dalhart, will be between 1985 and 1989. Studies now in progress may change this preliminary scheduling.

Additionally, the construction scenario for the OB complexes for Alternative 7 is identical with that for the Proposed Action (see Appendix 2) with the exception, as stated above, that the second OB complex will be built from the construction camp associated with the DDA in group number 11.

Figures 4-2 and 4-3 show the construction schedules associated with the first and second OB complexes, respectively.

DDA Construction

Protective shelters and DTN and cluster roads are the major construction items that originate from the plants/camps. A range of between 150 and 400 protective shelters could be built from a plant/camp. The range of DTN road mileage built from a plant/camp is between 50 and 150 mi. Between 200 and 550 mi of cluster roads can be constructed from a plant/camp. These number ranges differ from those discussed for the Proposed Action because different construction rates were used.

Fifteen construction groups with from 8 to 19 clusters are organized into three general regions. The schedule for construction is shown in Figure 4-4. Construction

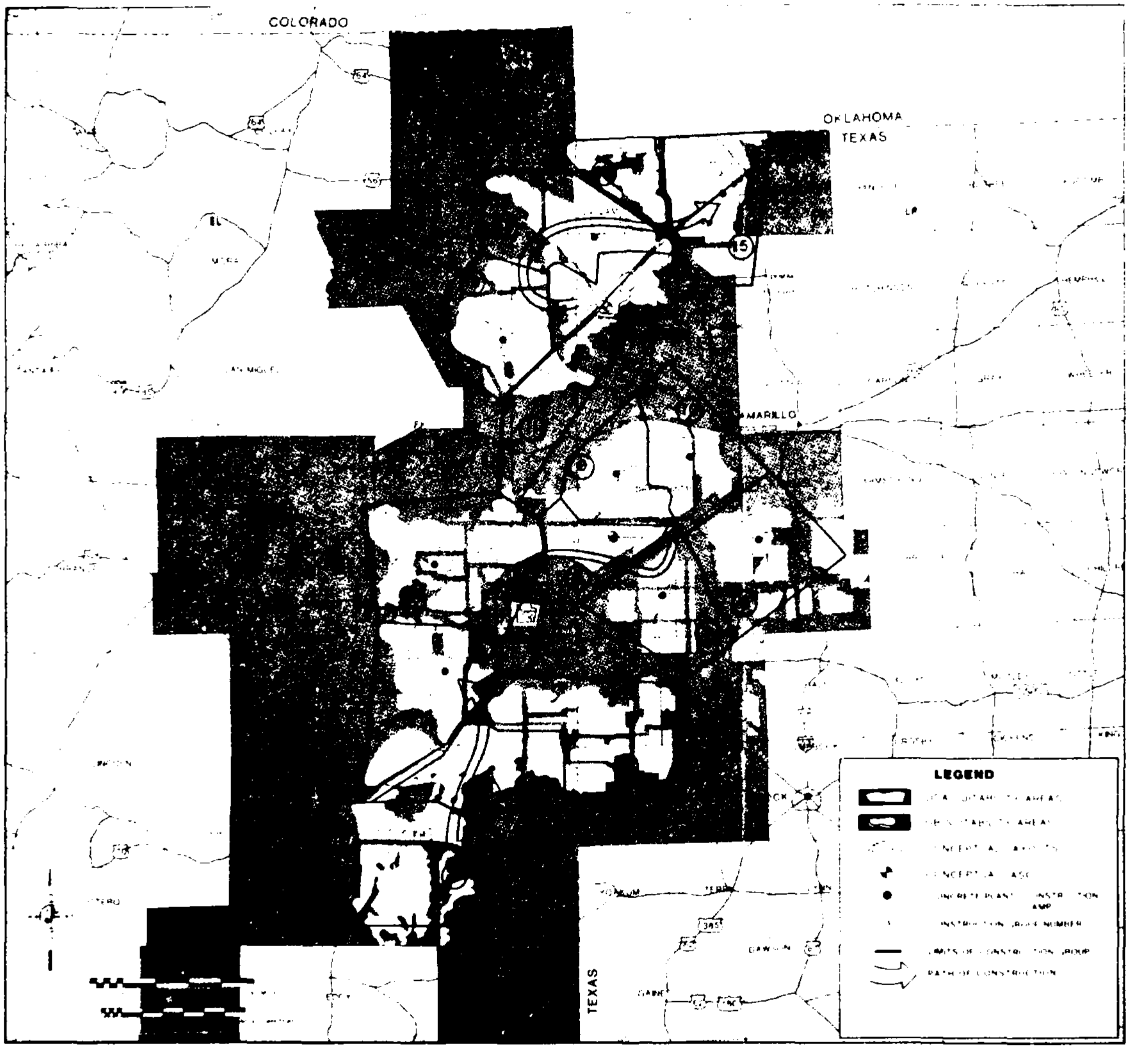

Figure 4-1. System layout with construction plan for Alternative 7, Texas New Mexico full basing.

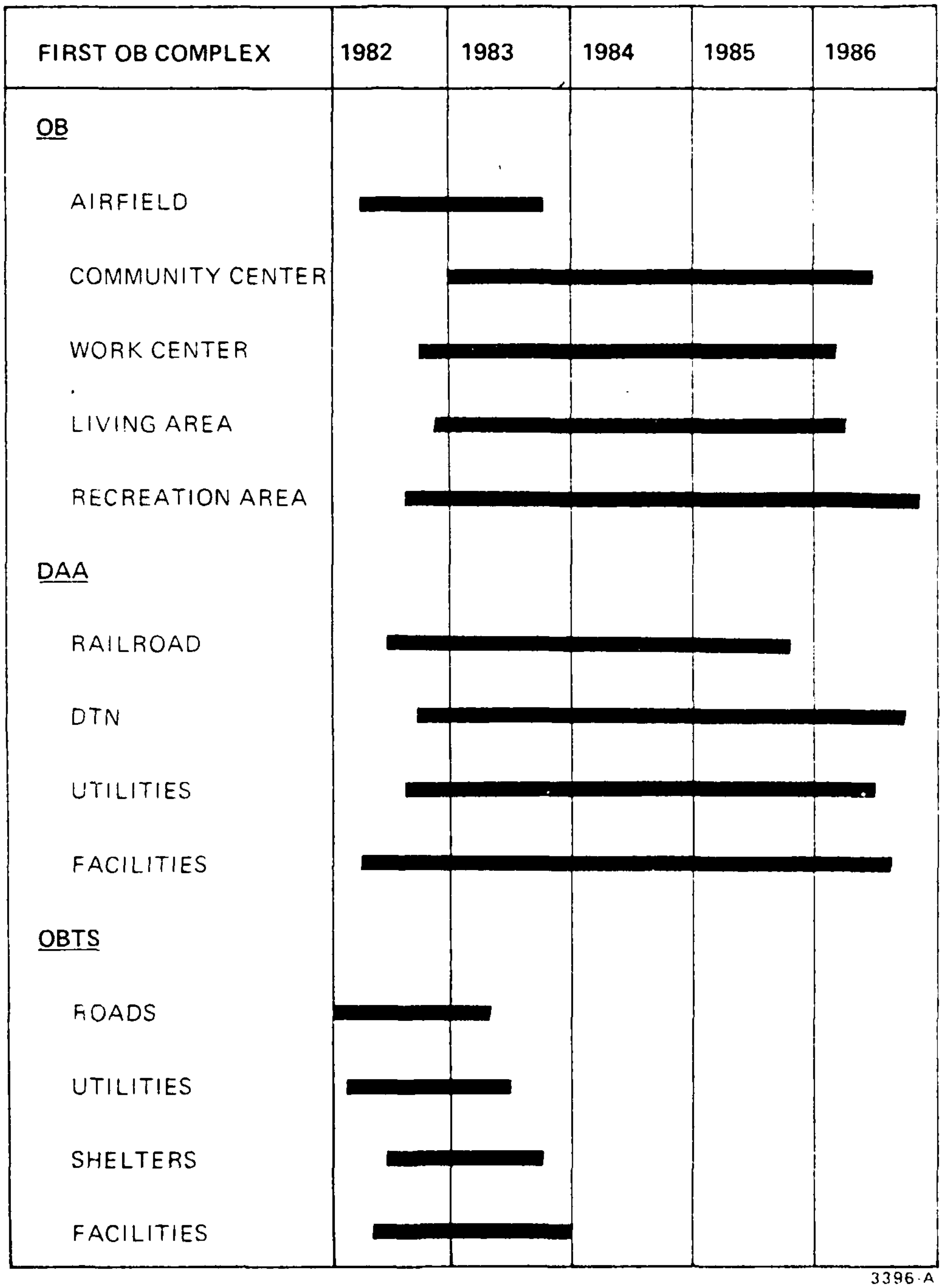

Figure 4-2. First OB complex construction schedule for Alternative 7, Texas/New Mexico full basing.

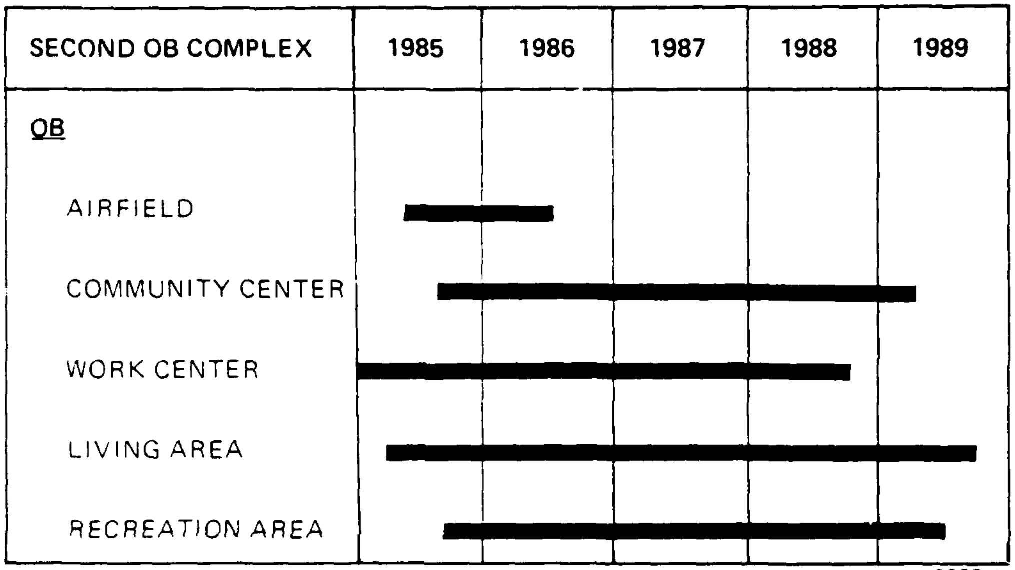

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Figure 4-3. Second OB complex construction schedule for Alternative 7, Texas/New Mexico full basing.

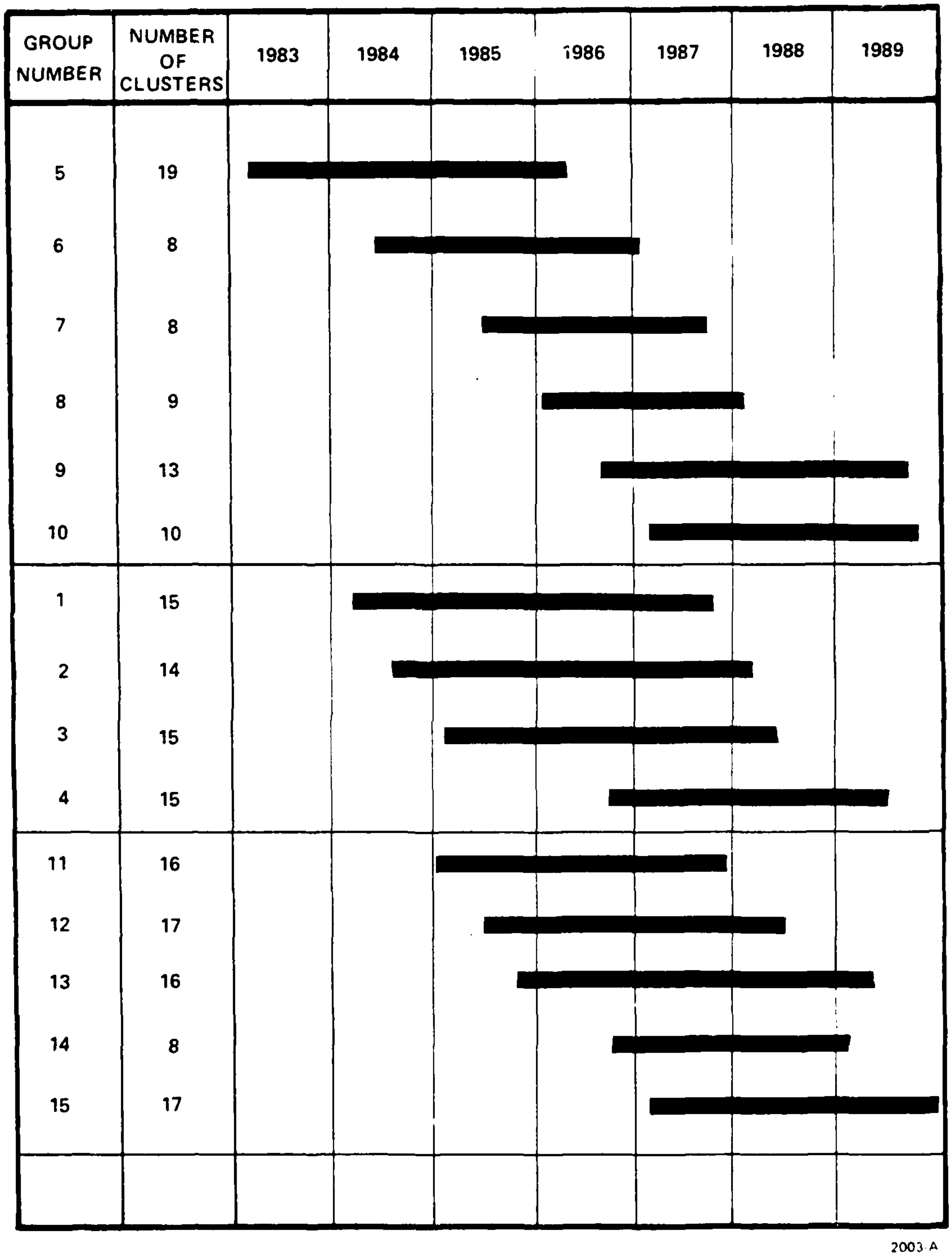


Figure 4-4. DDA construction schedule for Alternative 7, Texas/New Mexico full basing.

31

would begin at the first operating base complex located near Clovis and progress to construction group number 5 by 1983. By 1985, construction would be occurring in all three of the regions. Detailed schedules and milestones will be established following final review of inputs and additional engineering.

Construction Resource Requirements

Table 4-1 shows that the peak demand for construction, assembly and checkout (A&CO), and operations personnel occurs in 1987-1988 with approximately 30,000 persons employed. Personnel requirements for construction peak in 1987 with approximately 16,000 employees. Similar to the Proposed Action, A&CO personnel requirements peak over a three-year span, 1986-1988, with about 6,000 people needed in each of the years. Operations personnel will reach about 13,000 by late 1989, and remain constant thereafter. Tables 4-2, 4-3, and 4-4 give a more detailed breakdown for each of these types of personnel requirements.

Table 4-5 shows the total construction resources required for Alternative 7. Most of the construction resources reach a peak year demand in 1987. The same conditions apply to Alternative 7 as they did to the Proposed Action, as discussed in Appendix 2.

OB Complexes

The total construction resources required for both OB complexes are shown in Table 4-6. As is the situation with the Proposed Action, there is no one common peak year for all the construction resources. Except for two years of overlapping construction, the two OB complexes are constructed during different years.

DDA

The total resource requirements associated with construction of the DDA for the Texas/New Mexico full basing deployment are shown in Table 4-7. Water requirements include water for dust suppression, concrete, and direct employees, but not for revegatation. The disturbed areas include construction of protective shelters and roads but not temporary facilities, such as aggregate pits. Table 4-8 shows the construction resources required for each construction group.

Table 4-1. Average direct personnel requirements for Alternative 7, Texas/New Mexico full basing.

DESCRIPTION	PERSONNEL									
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Construction										
DDA[1]		950	2,600	[illegible] 100	12,050	13,900	11,750	[illegible],600		
First OB Complex[2]	1,150	1,900	2,400	2,[illegible]	1,200					
Second OB Complex[3]				200	1,350	2,050	1,450	750		
Subtotal	1,150	2,850	5,000	10,300	14,600	15,950	13,200	4,350		
A & CO										
DDA[1]										
First OB Complex[2]		50	100	1,750	3,150	3,150	3,100	3,100	50	
Second OB Complex[3]		350	900	1,800	2,850	2,850	2,800	2,650	50	
Subtotal		400	1,000	3,550	6,000	6,000	5,900	5,750	100	
Operations										
First OB Complex[2]			1,250	2,500	3,750	5,000	6,250	7,500	7,500	7,500
Second OB Complex[3]					1,400	2,800	4,250	5,700	5,700	5,700
Subtotal			1,250	2,500	5,150	7,800	10,500	13,200	13,200	13,200
Total	1,150	3,250	7,250	16,350	25,750	29,750	29,600	23,300	13,300	13,200

2170-3

[1]DDA includes PS, ASC, DTN, CMF, RSS, and CR.

[2]First OB complex includes OB, DAA, OBTS, and airfield. The possibility of using the existing airfield at Clovis exists, but was not considered for this analysis.

[3]Second OB complex includes OB and airfield.

Table 4-2. Average construction personnel requirements for Alternative 7, Texas/New Mexico full basing.

CAMP NUMBER[1]	CONSTRUCTION PERSONNEL							
	1982	1983	1984	1985	1986	1987	1988	1989
1			200	1,350	1,950	400		
2			250	1,350	1,400	550		
3				600	850	1,250	850	
4					50	1,200	2,300	400
5		950	2,000	2,000	200			
6			150	1,150	1,000			
7				200	1,250	700		
8					850	1,500	50	
9					50	750	1,850	650
10						500	1,350	800
11				1,200	2,150	1,050		
12				200	1,450	2,200	500	
13				50	800	1,500	1,650	250
14					50	800	1,250	50
15						900	1,950	1,450
Subtotal		950	2,600	8,100	12,050	13,900	11,750	3,600
First OB Complex[2]	1,150	1,900	2,400	2,000	1,200			
Second OB Complex[3]				200	1,350	2,050	1,450	750
Total	1,150	2,850	5,000	10,300	14,600	15,950	13,200	4,350

2171-1

[1]See Figure 4-1 and 4-4.
[2]See Figure 4-2.
[3]See Figure 4-3.

Table 4-3. Average A&CO personnel requirements for Alternative 7, Texas/New Mexico full basing.

GROUP NUMBER[1]	A & CO PERSONNEL							
	1983	1984	1985	1986	1987	1988	1989	1990
1			250	800	150			
2			350	400	300			
3				300	350	350	100	
4					150	300	600	
5	50	100	800	350				
6			250	300				
7				300	300			
8					400	250		
9					150	300	500	
10						200	500	
11			100	450	450	100		
12				250	400	450	100	
13					500	400	300	
14						250	250	
15						500	750	50
Subtotal	50	100	1,750	3,150	3,150	3,100	3,100	50
First OB Complex[2]	350	900	1,800	2,850	2,850	2,800	2,650	50
Second OB Complex[3]								
Total	400	1,000	3,550	6,000	6,000	5,900	5,750	100

2172-1

[1]See Figures 4-1 and 4-4.

[2]See Figure 4-2.

[3]See Figure 4-3.

Table 4-4. Average operations personnel requirements for Alternative 7, Texas/New Mexico full basing.

EMPLOYMENT TYPE	OPERATIONS PERSONNEL					
	1984	1985	1986	1987	1988	1989
FIRST OB COMPLEX						
Officer	100	200	300	400	500	600
Enlisted	950	1,925	2,900	3,850	4,800	5,750
Civilian	200	375	550	750	950	1,150
Subtotal	1,250	2,500	3,750	5,000	6,250	7,500
SECOND OB COMPLEX						
Officer			100	200	350	450
Enlisted			1,100	2,200	3,250	4,400
Civilian			200	400	650	850
Subtotal			1,400	2,800	4,250	5,700
Total	1,250	2,500	5,150	7,800	10,500	13,200

2173-1

NOTE: Operations employment will continue at 1989 levels throughout the operating life of the project.

Table 4-5. Total construction resources for Alternative 7. Texas/New Mexico full basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]	1,150	2,834	4,981	10,278	14,414	15,874	13,102	4,259
Water (AF)								
Incremental	380	3,217	5,922	15,554	20,494	21,225	13,636	2,503
Cumulative	380	3,597	9,519	23,073	45,567	66,792	80,428	82,931
Disturbed Area (Acres)								
Incremental	1,740	6,444	11,171	22,110	32,030	34,483	22,208	4,311
cumulative	1,740	8,184	19,355	41,465	73,495	107,978	130,186	134,497
Materials								
Steel (Tons)								
Incremental		850	12,163	45,362	76,287	103,797	112,592	45,139
Cumulative		850	13,013	58,375	134,662	238,459	351,051	396,190
Concrete (CY*1,000)								
Incremental		150	252	477	763	947	963	400
Cumulative		150	402	879	1,642	2,589	3,552	3,952
Asphalt (TNS*1,000)								
Incremental		657	968	2,442	1,198	1,508	170	100
Cumulative		657	1,625	4,068	5,266	6,774	6,944	7,044
Aggregate (CY*1,000)								
Incremental	140	1,863	3,483	8,910	12,210	11,781	6,421	277
Cumulative	140	2,003	5,486	14,396	26,606	38,387	44,308	45,085
Prime Coat (TNS)								
Incremental		2,403	4,414	10,032	5,041	6,936	1,610	850
Cumulative		2,403	7,217	17,249	22,290	29,226	30,836	31,686
Fencing (LF*1,000)								
Incremental			183	748	1,221	1,640	1,812	729
Cumulative			183	931	2,152	3,792	5,604	6,333

[1]Personnel numbers are yearly averages.

3316-3

Table 4-6. Total OB complex construction resources for Alternative 7, Texas/New Mexico full basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]	1,150	1,900	2,400	2,200	2,550	2,050	1,450	750
Water (AF)								
Incremental	380	620	750	820	950	800	570	280
Cumulative	380	1,000	1,750	2,570	3,520	4,320	4,890	5,170
Disturbed Area (Acres)								
Incremental	1,740	3,000	3,600	470	1,530	2,240		
cumulative	1,740	4,740	8,340	8,810	10,340	12,580		
Materials								
Steel (Tons)								
Incremental		850	1,000	880	990	720	500	250
Cumulative		850	1,850	2,730	3,720	4,440	4,940	5,190
Concrete (CY*1,000)								
Incremental		150	170	150	210	190	140	70
Cumulative		150	320	470	680	870	1,010	1,080
Asphalt (TNS*1,000)								
Incremental			280	240	150	240	170	100
Cumulative			280	520	670	910	1,080	1,180
Aggregate (CY*1,000)								
Incremental	140	220	260	290	330	290	210	100
Cumulative	140	360	620	910	1,240	1,530	1,740	1,840
Prime Coat (TNS)								
Incremental			2,300	1,980	1,210	2,300	1,610	850
Cumulative			2,300	4,280	5,490	7,790	9,400	10,250
Fencing (LF*1,000)								
Incremental			5	40	23	[illegible]	29	15
Cumulative			5	45	68	68	97	112

[1]Personnel numbers are yearly averages

3212-4

Table 4-7. Total DDA construction resources for Alternative 7, Texas/New Mexico full basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR 1983	1984	1985	1986	1987	1988	1989
Personnel[1]	934	2,581	8,078	11,864	13,824	11,652	3,509
Water (AF)							
Incremental	2,597	5,172	14,734	19,544	20,425	13,066	2,223
Cumulative	2,597	7,770	22,504	42,047	62,473	75,538	77,762
Disturbed Area (Acres)							
Incremental	3,444	7,571	21,640	30,500	32,243	22,208	4,311
Cumulative	3,444	11,015	32,655	63,155	95,398	117,606	121,917
Steel (TNS)							
Incremental		11,163	44,482	75,297	103,077	112,092	44,889
Cumulative		11,163	55,645	130,942	234,019	346,111	391,000
Concrete (CY *1,000)							
Incremental		82	327	553	757	823	330
Cumulative		82	409	961	1,718	2,541	2,870
Asphalt (TNS *1,000)							
Incremental	657	688	2,203	1,048	1,268		
Cumulative	657	1,345	3,548	4,595	5,864		
Aggregate (CY *1,000)							
Incremental	1,643	3,223	8,620	11,880	11,491	6,211	177
Cumulative	1,643	4,866	13,486	25,365	36,857	43,067	43,244
Prime Coat (TNS)							
Incremental	2,403	2,514	8,052	3,831	4,636		
Cumulative	2,403	4,917	12,969	16,801	21,437		
Fencing (LF *1,000)							
Incremental		178	708	1,198	1,640	1,783	714
Cumulative		178	885	2,083	3,722	5,505	6,219
Protective Shelters							
Incremental		131	523	886	1,213	1,319	528
Cumulative		131	655	1,540	2,753	4,072	4,600
Miles of DTN Roads							
Incremental	141	148	474	225	273		
Cumulative	141	289	763	988	1,261		
Miles of Cluster Roads							
Incremental	142	395	986	1,740	1,634	1,015	29
Cumulative	142	537	1,523	3,263	4,897	5,912	5,941

[1] These numbers are yearly averages

4001-1

TABLE 4-3. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 1
(PAGE 1 OF 15)

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
			QUANTITY PER YEAR				
PERSONNEL[1]		182.	1342.	1945.	386.		
WATER (AF)							
INCREMENTAL		524.	2587.	2266.	225.		
CUMULATIVE		524.	3111.	5377.	5602.		
DISTURBED AREA (ACRES)							
INCREMENTAL		646.	3957.	3825.	447.		
CUMULATIVE		646.	4603.	8428.	8875.		
MATERIALS							
STEEL(TNS)							
INCREMENTAL			6109.	18154.	5062.		
CUMULATIVE			6109.	24263.	29325.		
CONCRETE(CY*1000)							
INCREMENTAL			45.	133.	37.		
CUMULATIVE			45.	178.	215.		
ASPHALT(TNS*1000)							
INCREMENTAL		195.	140.				
CUMULATIVE		195.	335.				
AGGREGATE(CY*1000)							
INCREMENTAL		298.	1703.	1121.			
CUMULATIVE		298.	2002.	3123.			
PRIMECOAT(TNS)							
INCREMENTAL		712.	512.				
CUMULATIVE		712.	1224.				
FENCING(LF*1000)							
INCREMENTAL			97.	289.	81.		
CUMULATIVE			97.	386.	466.		
PROTECTIVE SHELTERS							
INCREMENTAL			72.	214.	60.		
CUMULATIVE			72.	285.	345.		
MILES OF DTN ROADS							
INCREMENTAL		42.	30.				
CUMULATIVE		42.	72.				
MILES OF CLUSTER RD							
INCREMENTAL		11.	251.	183.			
CUMULATIVE		11.	263.	446.			

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 2
(PAGE 2 OF 15)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]		253.	1364.	1402.	526.		
WATER (AF)							
INCREMENTAL		708.	2581.	1474.	306.		
CUMULATIVE		708.	3289.	4763.	5069.		
DISTURBED AREA (ACRES)							
INCREMENTAL		924.	4027.	2536.	609.		
CUMULATIVE		924.	4951.	7487.	8096.		
MATERIALS							
STEEL(TNS)							
INCREMENTAL			6354.	14119.	6897.		
CUMULATIVE			6354.	20473.	27370.		
CONCRETE(CY*1000)							
INCREMENTAL			47.	104.	51.		
CUMULATIVE			47.	150.	201.		
ASPHALT(TNS*1000)							
INCREMENTAL		196.	45.				
CUMULATIVE		196.	242.				
AGGREGATE(CY*1000)							
INCREMENTAL		438.	1741.	650.			
CUMULATIVE		438.	2180.	2830.			
PRIMECOAT(TNS)							
INCREMENTAL		718.	166.				
CUMULATIVE		718.	884.				
FENCING(LF*1000)							
INCREMENTAL			101.	225.	110.		
CUMULATIVE			101.	326.	435.		
PROTECTIVE SHELTERS							
INCREMENTAL			75.	166.	81.		
CUMULATIVE			75.	241.	322.		
MILES OF DTN ROADS							
INCREMENTAL		42.	10.				
CUMULATIVE		42.	52.				
MILES OF CLUSTER RD							
INCREMENTAL		34.	276.	106.			
CUMULATIVE		34.	310.	416.			

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 3
(PAGE 3 OF 15)

CONSTRUCTION RESOURCES	QUANTITY PER YEAR 1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]			584.	833.	1842.	838.	
WATER (AF)							
INCREMENTAL			1688.	2167.	1973.	488.	
CUMULATIVE			1688.	3855.	5828.	5316.	
DISTURBED AREA (ACRES)							
INCREMENTAL			2060.	3300.	3382.	970.	
CUMULATIVE			2060.	5360.	8742.	9712.	
MATERIALS							
STEEL(TNS)							
INCREMENTAL					18328.	10997.	
CUMULATIVE					18328.	29325.	
CONCRETE(CY*1000)							
INCREMENTAL					135.	81.	
CUMULATIVE					135.	215.	
ASPHALT(TNS*1000)							
INCREMENTAL			656.				
CUMULATIVE			656.				
AGGREGATE(CY*1000)							
INCREMENTAL			946.	1664.	890.		
CUMULATIVE			946.	2609.	3499.		
PRIMECOAT(TNS)							
INCREMENTAL			2397.				
CUMULATIVE			2397.				
FENCING(LF*1000)							
INCREMENTAL					292.	175.	
CUMULATIVE					292.	466.	
PROTECTIVE SHELTERS							
INCREMENTAL					216.	129.	
CUMULATIVE					216.	345.	
MILES OF DTN ROADS							
INCREMENTAL			141.				
CUMULATIVE			141.				
MILES OF CLUSTER RD							
INCREMENTAL			29.	272.	145.		
CUMULATIVE			29.	301.	446.		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 4
(PAGE 4 OF 15)

CONSTRUCTION RESOURCES	QUANTITY PER YEAR						
	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]				56.	1209.	2292.	386.
WATER (AF)							
INCREMENTAL				164.	2839.	2633.	225.
CUMULATIVE				164.	3003.	5636.	5861.
DISTURBED AREA (ACRES)							
INCREMENTAL				192.	4084.	4455.	447.
CUMULATIVE				192.	4276.	8732.	9178.
MATERIALS							
STEEL(TNS)							
INCREMENTAL					2618.	21645.	5062.
CUMULATIVE					2618.	24263.	29325.
CONCRETE(CY*1000)							
INCREMENTAL					19.	159.	37.
CUMULATIVE					19.	178.	215.
ASPHALT(TNS*1000)							
INCREMENTAL				74.	377.		
CUMULATIVE				74.	451.		
AGGREGATE(CY*1000)							
INCREMENTAL				87.	1889.	1284.	
CUMULATIVE				87.	1976.	3259.	
PRIMECOAT(TNS)							
INCREMENTAL				270.	1379.		
CUMULATIVE				270.	1649.		
FENCING(LF*1000)							
INCREMENTAL					42.	344.	81.
CUMULATIVE					42.	386.	466.
PROTECTIVE SHELTERS							
INCREMENTAL					31.	255.	60.
CUMULATIVE					31.	285.	345.
MILES OF DTN ROADS							
INCREMENTAL				16.	81.		
CUMULATIVE				16.	97.		
MILES OF CLUSTER RD							
INCREMENTAL					236.	210.	
CUMULATIVE					236.	446.	

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS?NEW MEXICO FULL BASING.

GROUP 5
(PAGE 5 OF 15)

CONSTRUCTION RESOURCES	QUANTITY PER YEAR						
	1983	1984	1985	1986	1987	1988	1989
PERSONNEL	934.	2008.	2024.	188.			
WATER (AF)							
INCREMENTAL	2597.	3538.	1648.	110.			
CUMULATIVE	2597.	6135.	7784.	7893.			
DISTURBED AREA (ACRES)							
INCREMENTAL	3444.	5518.	2995.	218.			
CUMULATIVE	3444.	8962.	11957.	12175.			
MATERIALS							
STEEL(TNS)							
INCREMENTAL		11163.	23512.	2470.			
CUMULATIVE		11163.	34675.	37145.			
CONCRETE(CY*1000)							
INCREMENTAL		82.	173.	18.			
CUMULATIVE		82.	255.	273.			
ASPHALT(TNS*1000)							
INCREMENTAL	657.	128.					
CUMULATIVE	657.	786.					
AGGREGATE(CY*1000)							
INCREMENTAL	1643.	2267.	464.				
CUMULATIVE	1643.	3910.	4374.				
PRIMECOAT(TNS)							
INCREMENTAL	2403.	470.					
CUMULATIVE	2403.	2873.					
FENCING(LF*1000)							
INCREMENTAL		178.	374.	39.			
CUMULATIVE		178.	552.	591.			
PROTECTIVE SHELTERS							
INCREMENTAL		131.	277.	29.			
CUMULATIVE		131.	408.	437.			
MILES OF DTN ROADS							
INCREMENTAL	141.	28.					
CUMULATIVE	141.	169.					
MILES OF CLUSTER RD							
INCREMENTAL	142.	346.	76.				
CUMULATIVE	142.	488.	564.				

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 6
(PAGE 6 OF 15)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL [1]		138.	1129.	968.	17.		
WATER (AF)							
INCREMENTAL		403.	2143.	1009.	10.		
CUMULATIVE		403.	2546.	3554.	3564.		
DISTURBED AREA (ACRES)							
INCREMENTAL		482.	3169.	1738.	20.		
CUMULATIVE		482.	3652.	5390.	5410.		
MATERIALS							
STEEL(TNS)							
INCREMENTAL			5598.	9819.	222.		
CUMULATIVE			5598.	15418.	15640.		
CONCRETE(CY*1000)							
INCREMENTAL			41.	72.	2.		
CUMULATIVE			41.	113.	115.		
ASPHALT(TNS*1000)							
INCREMENTAL		168.	269.				
CUMULATIVE		168.	437.				
AGGREGATE(CY*1000)							
INCREMENTAL		219.	1311.	440.			
CUMULATIVE		219.	1530.	1970.			
PRIMECOAT(TNS)							
INCREMENTAL		614.	984.				
CUMULATIVE		614.	1598.				
FENCING(LF*1000)							
INCREMENTAL			89.	156.	4.		
CUMULATIVE			89.	245.	249.		
PROTECTIVE SHELTERS							
INCREMENTAL			66.	116.	3.		
CUMULATIVE			66.	181.	184.		
MILES OF DTN ROADS							
INCREMENTAL		36.	58.				
CUMULATIVE		36.	94.				
MILES OF CLUSTER RD							
INCREMENTAL		4.	163.	72.			
CUMULATIVE		4.	166.	238.			

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 7

(PAGE 7 OF 15)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]			215.	1243.	689.		
WATER (AF)							
INCREMENTAL			603.	2108.	543.		
CUMULATIVE			603.	2711.	3254.		
DISTURBED AREA (ACRES)							
INCREMENTAL			782.	3270.	994.		
CUMULATIVE			782.	4052.	5046.		
MATERIALS							
STEEL(TNS)							
INCREMENTAL				7524.	8116.		
CUMULATIVE				7524.	15640.		
CONCRETE(CY*1000)							
INCREMENTAL				55.	60.		
CUMULATIVE				55.	115.		
ASPHALT(TNS*1000)							
INCREMENTAL			175.	122.			
CUMULATIVE			175.	298.			
AGGREGATE(CY*1000)							
INCREMENTAL			369.	1297.	140.		
CUMULATIVE			369.	1666.	1806.		
PRIMECOAT(TNS)							
INCREMENTAL			641.	447.			
CUMULATIVE			641.	1088.			
FENCING(LF*1000)							
INCREMENTAL				120.	129.		
CUMULATIVE				120.	249.		
PROTECTIVE SHELTERS							
INCREMENTAL				89.	95.		
CUMULATIVE				89.	184.		
MILES OF DTN ROADS							
INCREMENTAL			38.	26.			
CUMULATIVE			38.	64.			
MILES OF CLUSTER RD							
INCREMENTAL			27.	188.	23.		
CUMULATIVE			27.	215.	238.		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 8
(PAGE 8 OF 15)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL [1]				837.	1467.	39.	
WATER (AF)							
INCREMENTAL				1978.	1447.	23.	
CUMULATIVE				1978.	3425.	3447.	
DISTURBED AREA (ACRES)							
INCREMENTAL				2858.	2521.	45.	
CUMULATIVE				2858.	5380.	5425.	
MATERIALS							
STEEL(TNS)							
INCREMENTAL				1692.	15396.	508.	
CUMULATIVE				1692.	17087.	17595.	
CONCRETE(CY*1000)							
INCREMENTAL				12.	113.	4.	
CUMULATIVE				12.	125.	129.	
ASPHALT(TNS*1000)							
INCREMENTAL				242.			
CUMULATIVE				242.			
AGGREGATE(CY*1000)							
INCREMENTAL				1332.	586.		
CUMULATIVE				1332.	1918.		
PRIMECOAT(TNS)							
INCREMENTAL				884.			
CUMULATIVE				884.			
FENCING(LF*1000)							
INCREMENTAL				27.	245.	8.	
CUMULATIVE				27.	272.	280.	
PROTECTIVE SHELTERS							
INCREMENTAL				20.	181.	6.	
CUMULATIVE				20.	201.	207.	
MILES OF DTN ROADS							
INCREMENTAL				52.			
CUMULATIVE				52.			
MILES OF CLUSTER RD							
INCREMENTAL				171.	96.		
CUMULATIVE				171.	267.		

[1] PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
	QUANTITY PER YEAR						
PERSONNEL[1]				20.	739.	1834.	633.
WATER (AF)							
INCREMENTAL				58.	1921.	2168.	369.
CUMULATIVE				58.	1979.	4147.	4515.
DISTURBED AREA (ACRES)							
INCREMENTAL				68.	2841.	3650.	733.
CUMULATIVE				68.	2909.	5559.	7292.
MATERIALS							
STEEL(TNS)							
INCREMENTAL					191.	16918.	8306.
CUMULATIVE					191.	17109.	25415.
CONCRETE(CY*1000)							
INCREMENTAL					1.	124.	61.
CUMULATIVE					1.	126.	187.
ASPHALT(TNS*1000)							
INCREMENTAL				26.	113.		
CUMULATIVE				26.	140.		
AGGREGATE(CY*1000)							
INCREMENTAL				31.	1408.	1088.	
CUMULATIVE				31.	1438.	2526.	
PRIMECOAT(TNS)							
INCREMENTAL				96.	414.		
CUMULATIVE				96.	510.		
FENCING(LF*1000)							
INCREMENTAL					3.	269.	132.
CUMULATIVE					3.	272.	404.
PROTECTIVE SHELTERS							
INCREMENTAL					2.	199.	98.
CUMULATIVE					2.	201.	299.
MILES OF DTN ROADS							
INCREMENTAL				6.	24.		
CUMULATIVE				6.	30.		
MILES OF CLUSTER RD							
INCREMENTAL					208.	178.	
CUMULATIVE					208.	386.	

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 10
(PAGE 10 OF 15)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]					486.	1340.	764.
WATER (AF)							
INCREMENTAL					1328.	1883.	583.
CUMULATIVE					1328.	3211.	3794.
DISTURBED AREA (ACRES)							
INCREMENTAL					1827.	3082.	1076.
CUMULATIVE					1827.	4909.	5985.
MATERIALS							
STEEL(TNS)							
INCREMENTAL						10418.	9132.
CUMULATIVE						10418.	19550.
CONCRETE(CY*1000)							
INCREMENTAL						76.	67.
CUMULATIVE						76.	144.
ASPHALT(TNS*1000)							
INCREMENTAL					251.		
CUMULATIVE					251.		
AGGREGATE(CY*1000)							
INCREMENTAL					886.	1091.	136.
CUMULATIVE					886.	1976.	2112.
PRIMECOAT(TNS)							
INCREMENTAL					918.		
CUMULATIVE					918.		
FENCING(LF*1000)							
INCREMENTAL						166.	145.
CUMULATIVE						166.	311.
PROTECTIVE SHELTERS							
INCREMENTAL						123.	107.
CUMULATIVE						123.	230.
MILES OF DTN ROADS							
INCREMENTAL					54.		
CUMULATIVE					54.		
MILES OF CLUSTER RD							
INCREMENTAL					97.	178.	22.
CUMULATIVE					97.	275.	297.

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 11
(PAGE 11 OF 15)

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
			QUANTITY PER YEAR				
PERSONNEL[1]			1197.	2130.	1054.		
WATER (AF)							
INCREMENTAL			2849.	3112.	809.		
CUMULATIVE			2849.	5961.	6771.		
DISTURBED AREA (ACRES)							
INCREMENTAL			3844.	5059.	1492.		
CUMULATIVE			3844.	8903.	10395.		
MATERIALS							
STEEL(TNS)							
INCREMENTAL			2908.	15802.	12570.		
CUMULATIVE			2908.	18710.	31280.		
CONCRETE(CY*1000)							
INCREMENTAL			21.	116.	92.		
CUMULATIVE			21.	137.	230.		
ASPHALT(TNS*1000)							
INCREMENTAL			712.	9.			
CUMULATIVE			712.	721.			
AGGREGATE(CY*1000)							
INCREMENTAL			1708.	1846.	193.		
CUMULATIVE			1708.	3554.	3747.		
PRIMECOAT(TNS)							
INCREMENTAL			2603.	32.			
CUMULATIVE			2603.	2635.			
FENCING(LF*1000)							
INCREMENTAL			46.	251.	200.		
CUMULATIVE			46.	298.	498.		
PROTECTIVE SHELTERS							
INCREMENTAL			34.	186.	148.		
CUMULATIVE			34.	220.	368.		
MILES OF DTN ROADS							
INCREMENTAL			153.	2.			
CUMULATIVE			153.	155.			
MILES OF CLUSTER RD							
INCREMENTAL			142.	300.	32.		
CUMULATIVE			142.	442.	474.		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 12
(PAGE 12 OF 15)

CONSTRUCTION RESOURCES	QUANTITY PER YEAR						
	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]			208.	1438.	2218.	467.	
WATER (AF)							
INCREMENTAL			587.	2897.	2479.	272.	
CUMULATIVE			587.	3484.	5963.	6235.	
DISTURBED AREA (ACRES)							
INCREMENTAL			751.	4416.	4217.	541.	
CUMULATIVE			751.	5166.	9383.	9924.	
MATERIALS							
STEEL(TNS)							
INCREMENTAL				5717.	21389.	5129.	
CUMULATIVE				5717.	27106.	33235.	
CONCRETE(CY*1000)							
INCREMENTAL				42.	157.	45.	
CUMULATIVE				42.	199.	244.	
ASPHALT(TNS*1000)							
INCREMENTAL			184.	146.			
CUMULATIVE			184.	330.			
AGGREGATE(CY*1000)							
INCREMENTAL			352.	1951.	1175.		
CUMULATIVE			352.	2304.	3478.		
PRIMECOAT(TNS)							
INCREMENTAL			672.	535.			
CUMULATIVE			677.	1207.			
FENCING(LF*1000)							
INCREMENTAL				91.	340.	97.	
CUMULATIVE				91.	431.	529.	
PROTECTIVE SHELTERS							
INCREMENTAL				67.	252.	72.	
CUMULATIVE				67.	319.	391.	
MILES OF DTN ROADS							
INCREMENTAL			40.	31.			
CUMULATIVE			40.	71.			
MILES OF CLUSTER RD							
INCREMENTAL			22.	291.	192.		
CUMULATIVE			22.	313.	505.		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTA DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 13
(PAGE 13 OF 15)

CONSTRUCTION RESOURCES	QUANTITY PER YEAR						
	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]			16.	795.	1492.	1642.	226.
WATER (AF)							
INCREMENTAL			47.	2174.	2538.	1257.	132.
CUMULATIVE			47.	2220.	4759.	5016.	6148.
DISTURBED AREA (ACRES)							
INCREMENTAL			55.	2986.	4046.	2318.	261.
CUMULATIVE			55.	3041.	7087.	9405.	9666.
MATERIALS							
STEEL(TNS)							
INCREMENTAL					8728.	19589.	2962.
CUMULATIVE					8728.	28318.	31280.
CONCRETE(CY*1000)							
INCREMENTAL					64.	144.	22.
CUMULATIVE					64.	208.	230.
ASPHALT(TNS*1000)							
INCREMENTAL			21.	416.			
CUMULATIVE			21.	437.			
AGGREGATE(CY*1000)							
INCREMENTAL			25.	1447.	1652.	297.	
CUMULATIVE			25.	1471.	3123.	3420.	
PRIMECOAT(TNS)							
INCREMENTAL			77.	1521.			
CUMULATIVE			77.	1598.			
FENCING(LF*1000)							
INCREMENTAL					139.	312.	47.
CUMULATIVE					139.	450.	498.
PROTECTIVE SHELTERS							
INCREMENTAL					103.	230.	35.
CUMULATIVE					103.	333.	368.
MILES OF DTN ROADS							
INCREMENTAL			5.	89.			
CUMULATIVE			5.	94.			
MILES OF CLUSTER RD							
INCREMENTAL				157.	270.	49.	
CUMULATIVE				157.	426.	475.	

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

Table 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 14
(PAGE 14 OF 15)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]				10.	810.	1235.	38.
WATER (AF)							
INCREMENTAL				29.	1615.	1432.	22.
CUMULATIVE				29.	1644.	3076.	3098.
DISTURBED AREA (ACRES)							
INCREMENTAL				34.	2366.	2420.	44.
CUMULATIVE				34.	2400.	4819.	4864.
MATERIALS							
STEEL(TNS)							
INCREMENTAL					3559.	11580.	501.
CUMULATIVE					3559.	15139.	15640.
CONCRETE(CY*1000)							
INCREMENTAL					26.	85.	4.
CUMULATIVE					26.	111.	115.
ASPHALT(TNS*1000)							
INCREMENTAL				13.	215.		
CUMULATIVE				13.	228.		
AGGREGATE(CY*1000)							
INCREMENTAL				15.	1004.	705.	
CUMULATIVE				15.	1019.	1724.	
PRIMECOAT(TNS)							
INCREMENTAL				47.	786.		
CUMULATIVE				47.	833.		
FENCING(LF*1000)							
INCREMENTAL					57.	184.	8.
CUMULATIVE					57.	241.	249.
PROTECTIVE SHELTERS							
INCREMENTAL					42.	136.	6.
CUMULATIVE					42.	178.	184.
MILES OF DTN ROADS							
INCREMENTAL				3.	46.		
CUMULATIVE				3.	49.		
MILES OF CLUSTER RD							
INCREMENTAL					123.	115.	
CUMULATIVE					123.	238.	

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 4-8. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR ALTERNATIVE 7, TEXAS/NEW MEXICO FULL BASING.

GROUP 15
(PAGE 15 OF 15)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL [1]					889.	1965.	1462.
WATER (AF)							
INCREMENTAL					2391.	2910.	893.
CUMULATIVE					2391.	5301.	6194.
DISTURBED AREA (ACRES)							
INCREMENTAL					3399.	4726.	1750.
CUMULATIVE					3399.	8126.	9875.
MATERIALS							
STEEL(TNS)							
INCREMENTAL						14310.	18925.
CUMULATIVE						14310.	33235.
CONCRETE(CY*1000)							
INCREMENTAL						105.	139.
CUMULATIVE						105.	244.
ASPHALT(TNS*1000)							
INCREMENTAL					312.		
CUMULATIVE					312.		
AGGREGATE(CY*1000)							
INCREMENTAL					1670.	1747.	40.
CUMULATIVE					1670.	3416.	3456.
PRIMECOAT(TNS)							
INCREMENTAL					1139.		
CUMULATIVE					1139.		
FENCING(LF*1000)							
INCREMENTAL						228.	301.
CUMULATIVE						228.	529.
PROTECTIVE SHELTERS							
INCREMENTAL						168.	223.
CUMULATIVE						168.	391.
MILES OF DTN ROADS							
INCREMENTAL					67.		
CUMULATIVE					67.		
MILES OF CLUSTER RD							
INCREMENTAL					213.	285.	7.
CUMULATIVE					213.	498.	505.

[1] PERSONNEL NUMBERS ARE YEARLY AVERAGES.

APPENDIX 5

ALTERNATIVE 8, NEVADA/UTAH/TEXAS/NEW MEXICO SPLIT BASING WITH OB COMPLEXES NEAR COYOTE SPRING VALLEY, NEVADA AND CLOVIS, NEW MEXICO.

LIST OF FIGURES

LIST OF TABLES

ALTERNATIVE 8

Description

Alternative 8, split basing, proposes a first OB complex near Coyote Spring Valley, Nevada with a second OB complex near Clovis, New Mexico. Split basing denotes dividing the required 200 clusters into several deployment regions. The alternative under consideration will distribute the clusters among the four states of Nevada, Utah, Texas, and New Mexico.

Construction Scenario

The construction plan used in the analysis of the portion of Alternative 8 for the Nevada/Utah region with the first OB complex near Coyote Spring Valley, Nevada, is shown in Figure 5-1. The construction plan for the Texas/New Mexico portion of Alternative 8, with the second OB complex near Clovis, New Mexico, is shown in Figure 5-2.

For the split basing deployment portion in Nevada/Utah, five to seven concrete plants would be required in a total of nine different locations. In the Texas/New Mexico portion, four to six concrete plants would be needed in a total of eight different locations. Colocated with these plants would be the construction camps, marshalling yards/staging areas, and life support facilities. The exact locations for these plants/camps will be determined based on the following criteria: water availability, aggregate availability, and minimum haul distances.

OB Complex Construction

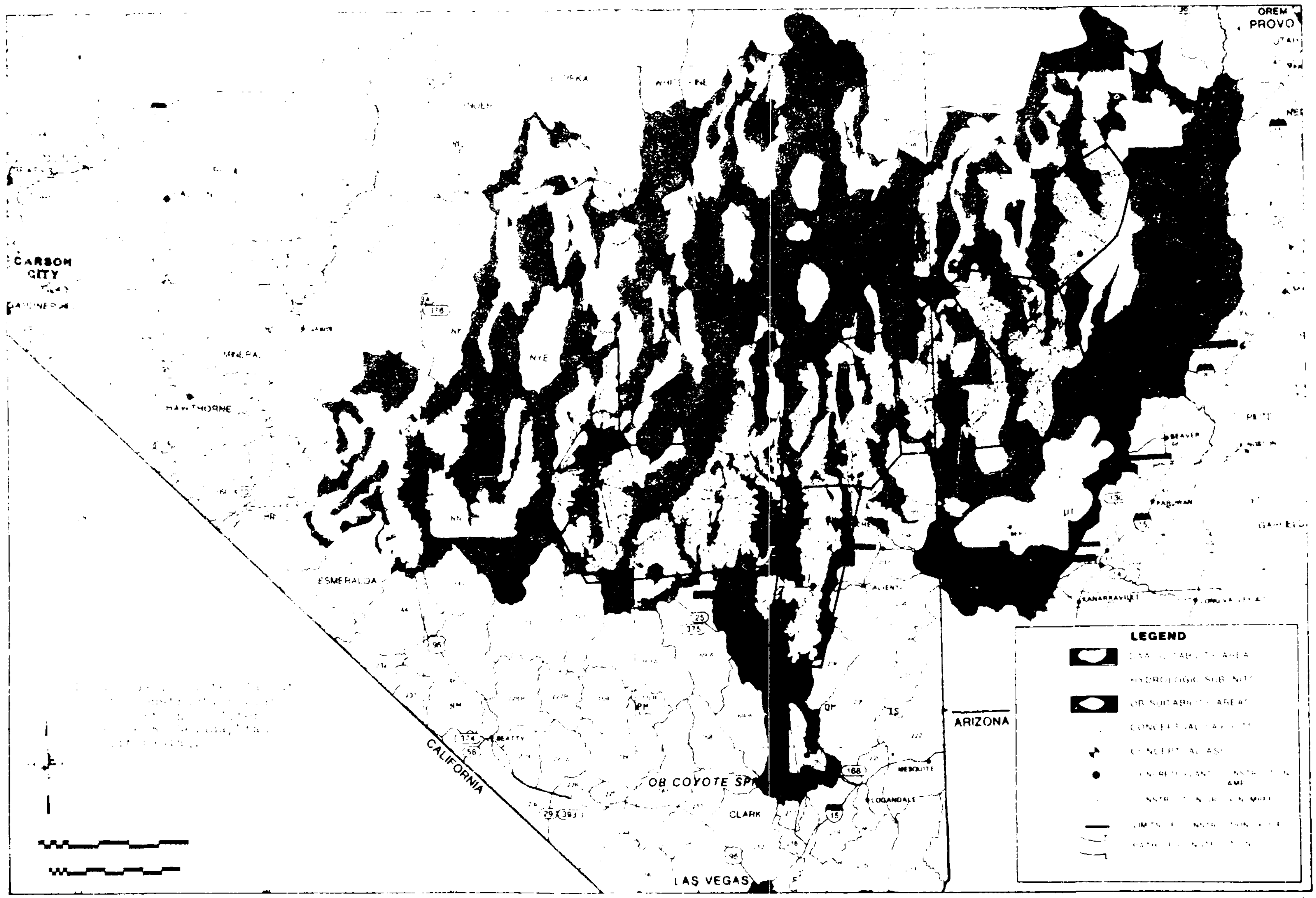
Each of the OB complexes will have a construction camp for the building construction, such as concrete and concrete block structures, metal structures, and wood frame structures.

The first OB complex, near Coyote Spring Valley, Nevada, contains an OB, DAA, OBTS, and an airfield. Construction is scheduled to start in 1982, and to be completed in time for IOC in 1986. As is the case with the Proposed Action, most of the construction in the first year will be concentrated in the DAA, OBTS, and at the airfield. A section of the DTN connecting the DAA to the DDA will also be constructed from the camp in the OB complex. Construction in the OBTS and at the airfield should be completed by 1984. The construction schedule for the first OB complex is shown in Figure 5-3.

The second OB complex, near Clovis, New Mexico, contains an OB, DAA, and an airfield. Split basing is the only deployment alternative that requires a DAA in the second OB complex. Construction is scheduled to begin in 1983 and continue through to 1987. The second OB complex does not have to be operational for IOC. Figure 5-4 shows the construction schedule for the second OB complex.

DDA Construction

The key construction items originating from the DDA plants/camps are DTN roads, cluster roads, and protective shelters. The length of the DTN road constructed from a plant/camp is between 50 and 200 mi. Between 300 and 750 mi



OREM
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LOGANDALE
BEAVER
KANARRAVILLE
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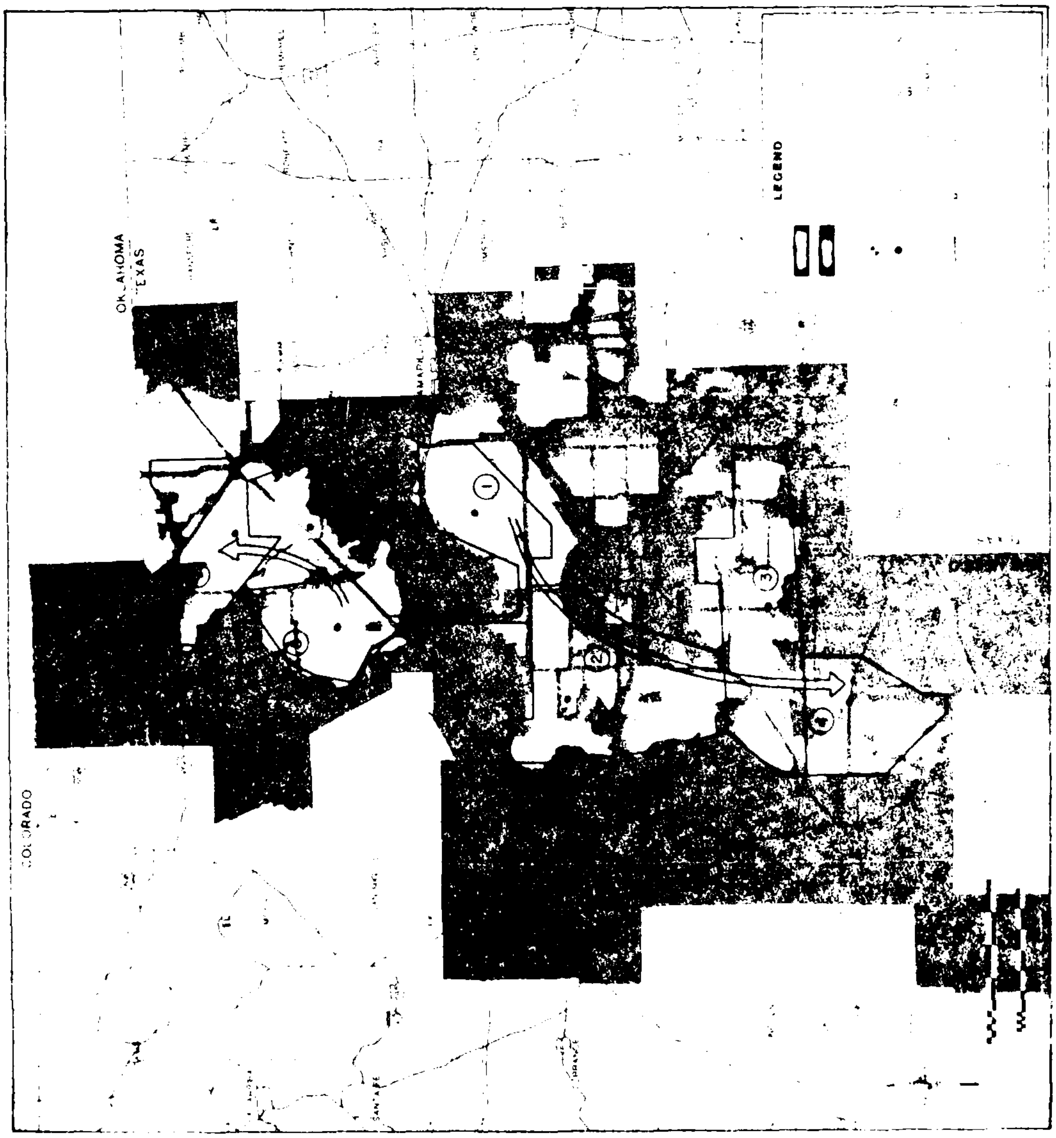
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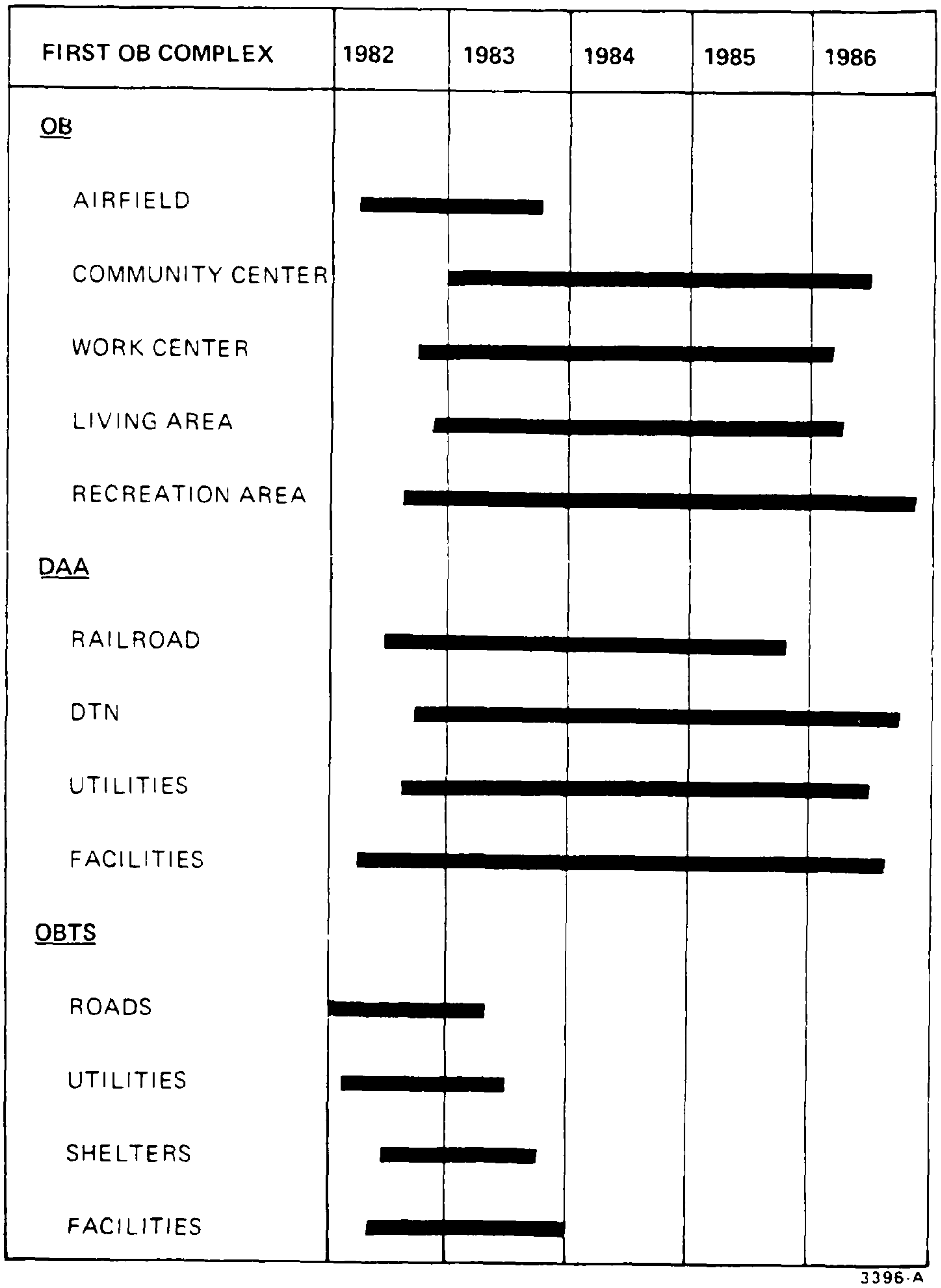

Figure 5-3. First OB complex construction schedule for portion of Alternative 8, Nevada/Utah split basing.

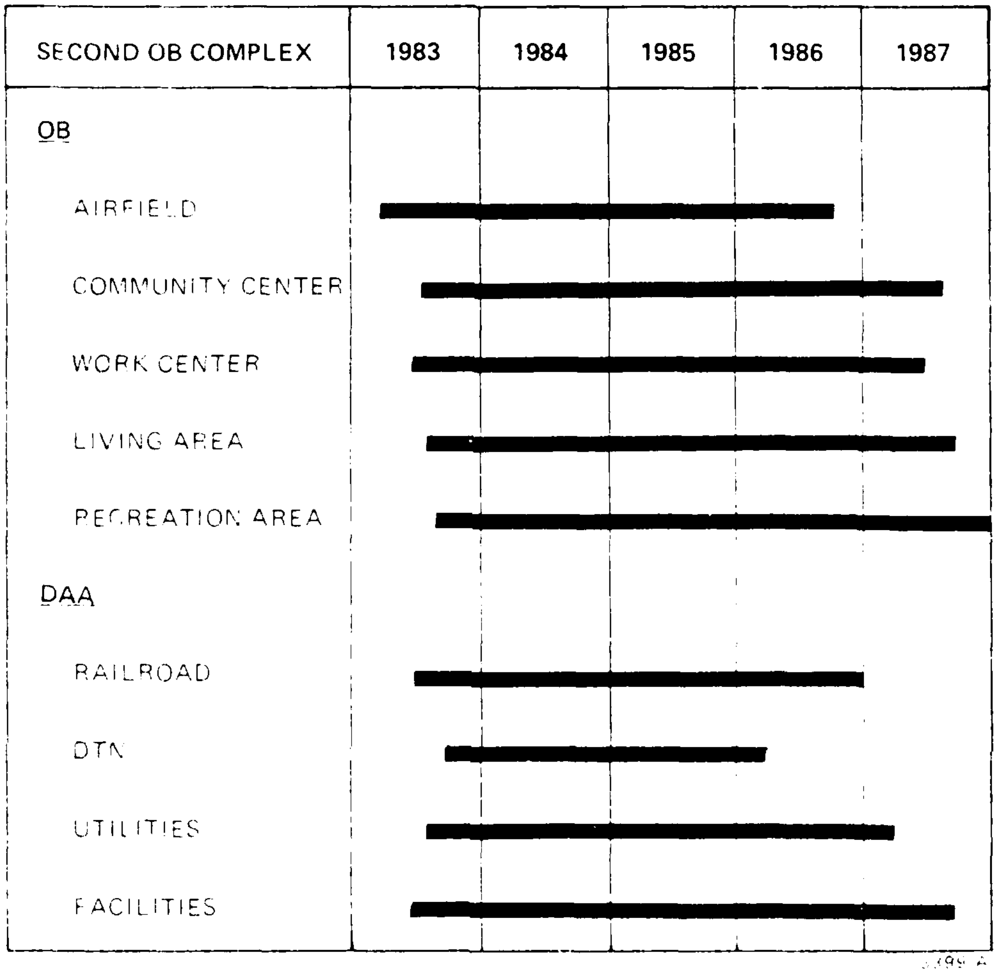

Figure 5-4. Second OB complex construction schedule for portion of Alternative 8, Texas New Mexico split basing.

of cluster roads can be constructed from a plant/camp. The number of protective shelters built from a plant/camp ranges from 200 to 400.

Eight construction groups were combined in two general regions to produce the schedule in Figure 5-5 for the Nevada/Utah portion of Alternative 8. Construction would begin at the first OB complex in 1982, and progress to Construction Group Number 1 by 1983. The early 1984 construction would be occurring in both of the regions. The construction period for a group ranges from two and one-half to three years.

For the Texas/New Mexico portion of Alternative 8, seven construction groups, containing between 12 and 16 clusters were combined in two general regions. Construction operations for this representative system were analyzed in accordance with the schedule shown in Figure 5-6. Construction would begin at the second OB complex in 1983 and by mid-1985 would be occurring in both regions. Changes to the construction schedule could be made.

Construction Resource Requirements

Tables 5-1 and 5-2 show the average direct personnel required for Alternative 8 for any given year in Nevada/Utah and Texas/New Mexico, respectively. The peak year for construction personnel occurs in 1985-1986 for Nevada/Utah, with approximately 8,000 workers, and 1986-1987 for Texas/New Mexico, with approximately 9,000 workers. The average construction work force for split basing would peak in 1986 with approximately 17,000 personnel required. These numbers coincide with those for the Proposed Action. The combined A&CO personnel requirements peak over a four-year span, 1986-1989, with about 7,000 people needed in each of the years. Combined operations personnel peak in 1989, at the time of FOC, with over 13,000 people required. Both A&CO and operations personnel required for Alternative 8 exceed the requirements for the Proposed Action. This is because the second OB complex for Alternative 8 has a DAA, whereas it does not for the Proposed Action. Tables 5-3, 5-4, 5-5, and 5-6 give a more detailed breakdown of personnel requirements for construction, A&CO, and operations.

The total construction resources for Alternative 8, split basing in Nevada/Utah and in Texas/New Mexico are shown in Tables 5-7 and 5-8, respectively. For Nevada/Utah the incremental construction resources quantities peak in a span from 1985 to 1986. The incremental quantities for construction resources for Texas/New Mexico also peak over a span of two years, 1986-1987. Generally, the cumulative construction resources requirements for Nevada/Utah/Texas/New Mexico (Alternative 8) are higher than for the Proposed Action because there is a DAA located in the second OB complex.

OB Complexes

Tables 5-9 and 5-10 show the total construction resources for the first OB complex (Nevada/Utah) and the second OB complex (Texas/New Mexico), respectively. The first OB complex is constructed between 1982 and 1986, with the peak year requirements generally occurring in 1984. The second OB complex is constructed between 1983 and 1987, with 1985 generally being the peak year for construction resources.

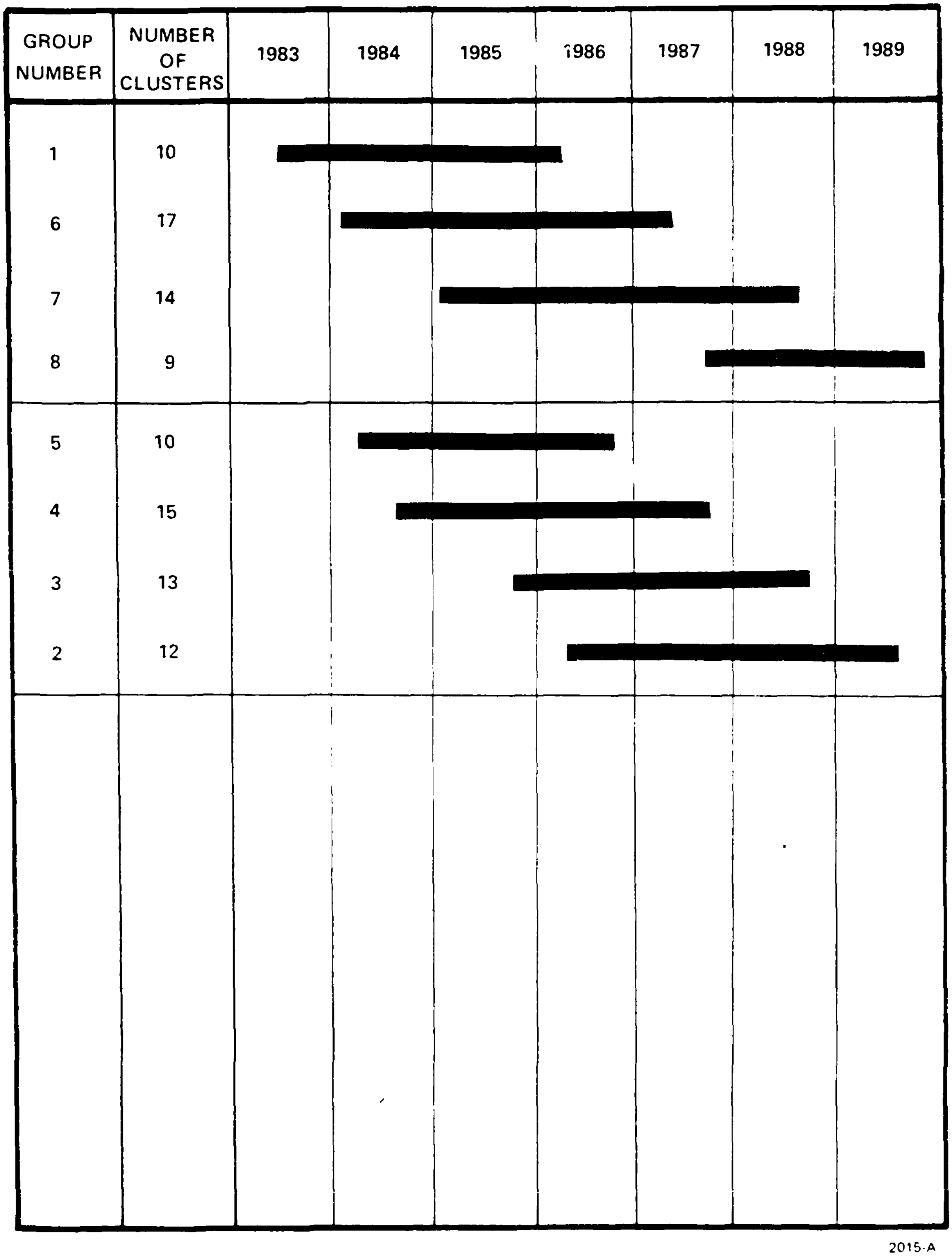

Figure 5-5. DDA construction schedule for portion of Alternative 8, Nevada/Utah split basing.

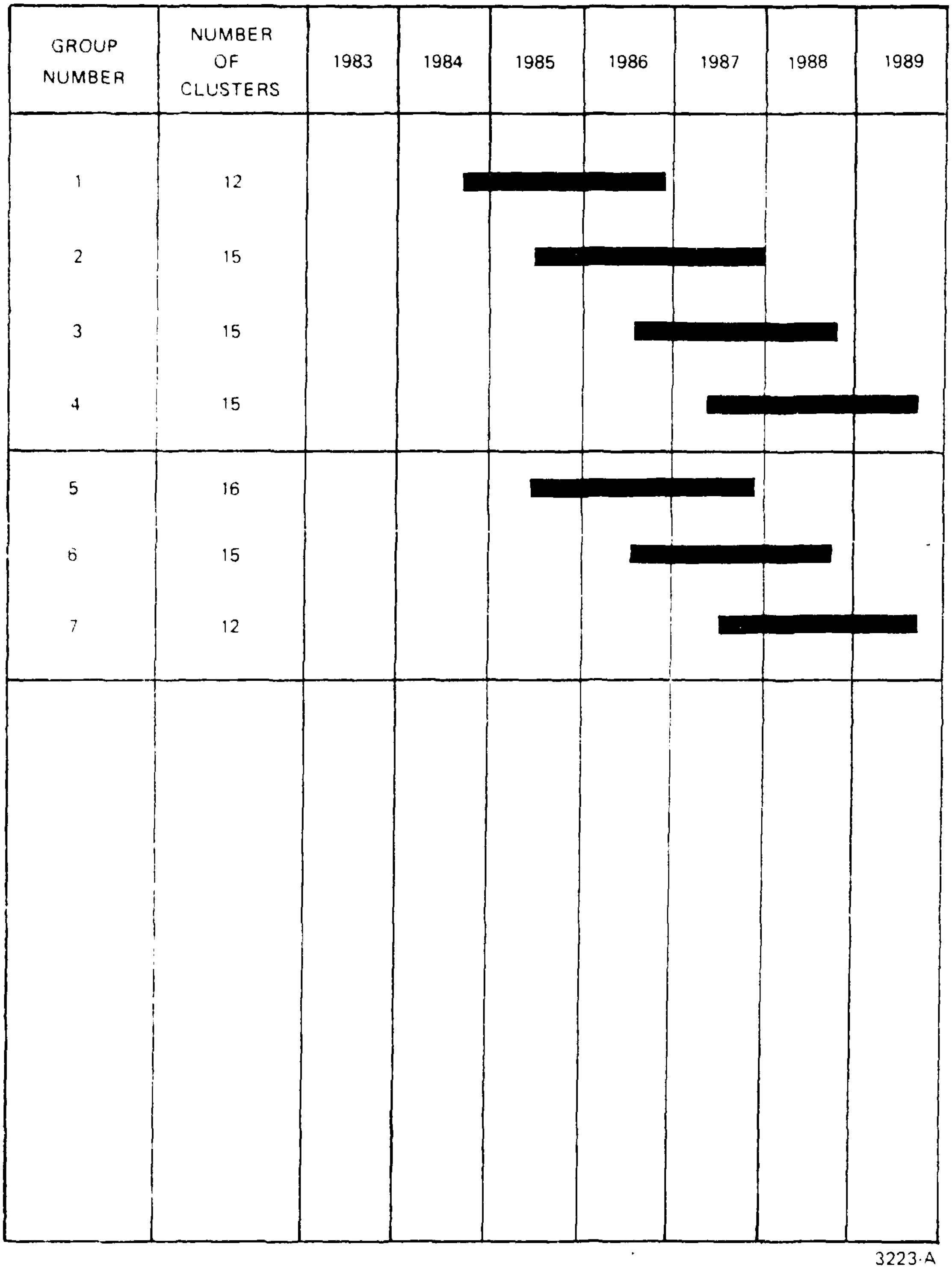

Figure 5-6. DDA construction schedule for portion of Alternative 8, Texas/New Mexico split basing.

Table 5-1. Average direct personnel requirements for portion of Alternative 8, Nevada/Utah split basing.

DESCRIPTION	PERSONNEL									
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Construction										
DDA[1]		100	1,900	6,200	6,750	6,350	4.500	1.200		
First OB Complex[2]	1,100	1,850	2,400	2,050	1,250					
Subtotal	1,100	1,950	4,300	8.250	8,000	6,350	4.500	1.200		
A & CO										
DDA[1]		50	100	1,350	2,300	1,650	900	950		
First OB Complex[2]		250	700	1,350	2,150	2,150	2.100	2.000	50	
Subtotal		300	800	2,700	4.450	3,800	3,000	2,950	50	
Operations										
First OB Complex[2]			1,250	2,450	3,700	4.950	6.250	7.400	7.400	7.400
TOTAL	1,100	2,250	6,350	13,400	16,150	15,100	13.750	11.550	7.450	7.400

2250-3

[1]DDA includes PS. ASC. DTN. CMF. RSS. and CR.

[2]First OB complex includes OB. DAA. OBTS. and airfield.

Table 5-2. Average direct personnel requirements for portion of Alternative 8, Texas/New Mexico split basing.

DESCRIPTION	PERSONNEL									
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
[illegible]										
[illegible]			[illegible]	1,950	[illegible]	[illegible]	6,800	2,650		
[illegible]		[illegible]	[illegible]	2,400	2,000	1,200				
[illegible]		[illegible]	[illegible]	4,350	[illegible]	[illegible]	6,800	2,650		
[illegible]				400	850	1,500	2,200	2,150	50	
[illegible]		[illegible]	700	1,350	2,150	2,150	[illegible]	2,000	50	
[illegible]		25	700	1,750	[illegible]	[illegible]	[illegible]	4,150	[illegible]	
[illegible]				1,200	2,400	3,700	[illegible]	[illegible]	[illegible]	6,050
[illegible]		[illegible]	[illegible]	7,350	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6,050

[illegible]

[illegible] MF, ESS, and CR.

[illegible] DAA, and airfield.

Table 5-3. Average construction personnel requirements for portion of Alternative 8, Nevada/Utah split basing.

GROUP NUMBER[1]	CONSTRUCTION PERSONNEL							
	1982	1983	1984	1985	1986	1987	1988	1989
1		100	1,000	1,500	150			
2					[illegible]	[illegible]	[illegible]	200
3				[illegible]	[illegible]	[illegible]	800	
4			50	[illegible]	1,150	[illegible]		
5			250	[illegible]	[illegible]			
6			500	1,000	[illegible]			
7				250	[illegible]	[illegible]	500	
8						[illegible]	[illegible]	700
Subtotal		100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
First Ob Complex[2]	1,100	1,850	[illegible]	[illegible]	[illegible]			
Total	1,100	1,950	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

2551-[illegible]

[1]See Figures 5-1 and 5-5

[2]See Figure 5-2

Table 5-4. Average construction personnel requirements for portion of Alternative 8, Texas/New Mexico split basing.

GROUP NUMBER[1]	CONSTRUCTION PERSONNEL							
	1982	1983	1984	1985	1986	1987	1988	1989
1			100	1,200	1,950			
2				450	1,850	1,750		
3					700	2,000	1,500	
4						450	2,100	1,250
5				300	1,900	1,900		
6					350	1,950	1,500	
7						100	1,700	1,400
Subtotal				1,950	6,750	8,150	6,800	2,650
Second OB Complex[2]		300	1,850	2,400	2,000	1,200		
Total		300	1,950	4,350	8,750	9,350	6,800	2,650

3568-2

[1]See Figures 5-2 and 5-6.

[2]See Figures 5-4.

Table 5-5. Average A&CO and operations personnel requirements for portion of Alternative 8, Nevada/Utah split basing.

	GROUP NUMBER OR EMPLOYMENT TYPE[1]	A & CO AND OPERATIONS PERSONNEL								
		1982	1983	1984	1985	1986	1987	1988	[illegible]	[illegible]
A & CO	1		50	50	400	200	50			
	2						100	350	150	
	3					300	450	200	50	
	4				200	600	350			
	5				400	250	100			
	6			50	250	600	200			
	7				100	250	400	150		
	8							200	450	
	Subtotal		50	100	1,350	2,300	1,650	[illegible]	[illegible]	
	First OB Complex[2]		250	700	1 350	2,150	2,150	[illegible]	[illegible]	[illegible]
	Total		300	800	2,700	4,450	3,800	[illegible]	[illegible]	[illegible]
OPERATIONS	First OB Complex[2]									
	Officer			100	200	300	400	500	600	600
	Enlisted			950	1,900	2,850	3,800	[illegible]	[illegible]	[illegible]
	Civilian			200	350	550	750	950	[illegible]	1,100
	Total			1,250	2,450	3,700	4,950	[illegible]	[illegible]	[illegible]

2512-1

[1] See Figures 5-1 and 5-5.

[2] See Figure 5-3

Note: Operations employment will continue at 1989 levels throughout the operating life of the project.

Table 5-6. Average A&CO and operations personnel requirements for portion of Alternative 8, Texas/New Mexico split basing.

	GROUP NUMBER[1] OR EMPLOYMENT TYPE	A & CO AND OPERATIONS PERSONNEL								
		1982	1983	1984	1985	1986	1987	1988	1989	1990
A & CO	1			400	460					
	2				190		580	300		
	3						170	500	400	
	4							370	700	
	5				200		580	370		
	6						170	500	400	
	7							160	650	50
	Subtotal			400	850		1,500	2,200	2,150	50
	Second OB Complex[2]		250	700	1,350	2,150	2,150	2,100	2,000	50
	Total		250	700	1,750	3,000	3,650	4,300	4,150	100
OPERATIONS	Second OB Complex[2]									
	Officer				100	200	300	400	500	500
	Enlisted				950	1,850	2,850	3,700	4,650	4,650
	Civilian				200	350	550	750	900	900
	Total				1,250	2,400	3,700	4,850	6,050	6,050

3567-2

[1]See Figures 5-2 and 5-6.

[2]See Figure 5-4.

NOTE: Operations employment will continue at 1989 levels throughout the operating life of the project.

Table 5-7. Total construction resources for portion of Alternative 8, Nevada/Utah split basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]	1,100	1,971	4,314	8,274	7,993	6,323	4,450	1,208
Water (AF)								
Incremental	360	947	5,696	11,672	10,346	8,671	5,387	704
Cumulative	360	1,307	7,003	18,675	29,021	37,692	[illegible]	43,783
Disturbed Area (Acres)								
Incremental	1,670	3,339	10,513	16,687	15,528	14,057	8,934	1,399
cumulative	1,670	5,009	15,522	32,209	47,737	61,794	70,728	72,127
Materials								
Steel (Tons)								
Incremental		820	3,086	36,327	51,265	50,972	40,443	15,586
Cumulative		820	3,906	40,233	91,498	142,470	182,913	198,769
Concrete (CY*1,000)								
Incremental		140	195	410	463	374	297	116
Cumulative		140	335	745	1,208	1,582	1,879	1,995
Asphalt (TNS*1,000)								
Incremental		160	1,233	1,217	1,004	256	132	
Cumulative		160	1,393	2,610	3,614	3,870	4,002	
Aggregate (CY*1,000)								
Incremental	130	388	3,450	6,924	5,588	4,784	2,686	
Cumulative	130	518	3,968	10,892	16,480	21,264	23,950	
Prime Coat (TNS)								
Incremental		587	5,733	5,521	4,315	935	488	
Cumulative		587	6,320	11,841	16,156	17,091	17,579	
Fencing (LF*1,000)								
Incremental			37	604	831	811	643	254
Cumulative			37	641	1,472	2,283	2,926	3,180

[1]Personnel numbers are yearly averages.

3318-2

Table 5-8. Total construction resources for portion of Alternative 8, Texas/New Mexico split basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]		300	1,933	4,326	8,711	9,294	6,811	2,658
Water (AF)								
Incremental		110	885	5,748	12,701	11,546	8,984	1,782
Cumulative		110	995	6,743	19,444	30,990	39,974	41,756
Disturbed Area (Acres)								
Incremental		570	3,607	10,913	18,157	17,993	14,625	3,402
Cumulative		570	4,177	15,090	33,247	51,240	65,865	69,267
Materials								
Steel (TNS)								
Incremental			740	3,315	38,188	65,561	57,278	33,369
Cumulative			740	4,055	42,243	107,804	165,082	198,451
Concrete (CY*1,000)								
Incremental			140	197	424	568	420	245
Cumulative			140	337	761	1,329	1,749	1,994
Asphalt (TNS*1,000)								
Incremental			110	1,309	1,333	546	304	
Cumulative			110	1,419	2,752	3,298	3,602	
Aggregate (CY*1,000)								
Incremental		40	359	3,429	7,582	6,257	4,783	231
Cumulative		40	399	3,828	11,410	17,667	22,450	22,681
Prime Coat (TNS)								
Incremental			403	6,073	5,947	2,580	1,113	
Cumulative			403	6,476	12,423	15,003	16,116	
Fencing (LF*1,000)								
Incremental				38	635	1,058	911	531
Cumulative				38	673	1,731	2,642	3,173

[1]Personnel numbers are yearly averages.

3324-3

Table 5-9. Total OB complex construction resources for portion of Alternative 8, Nevada/Utah split basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]	1,100	1,850	2,400	2,050	1,250			
Water (AF)								
Incremental	360	590	780	680	390			
Cumulative	360	950	1,730	2,410	2,800			
Disturbed Area (Acres)								
Incremental	1,670	2,920	3,750					
cumulative	1,670	4,590	8,340					
Materials								
Steel (TNS)								
Incremental		820	1,050	880	520			
Cumulative		820	1,870	2,750	3,270			
Concrete (CY*1,000)								
Incremental		140	180	150	90			
Cumulative		140	320	470	560			
Asphalt (TNS*1,000)								
Incremental			250	210	130			
Cumulative			250	460	590			
Aggregate (CY*1,000)								
Incremental	130	200	270	230	140			
Cumulative	130	330	600	830	970			
Prime Coat (TNS)								
Incremental			2,140	1,840	1,120			
Cumulative			2,140	3,980	5,100			
Fencing (LF*1,000)								
Incremental			5	40	23			
Cumulative			5	45	68			

[1] Personnel numbers are yearly averages.

3314-3

Table 5-10. Total OB complex construction resources for portion of Alternative 8, Texas/New Mexico split basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]		300	1,850	2,400	2,000	1,200		
Water (AF)								
Incremental		110	640	830	710	400		
Cumulative		110	750	1,580	2,290	2,690		
Disturbed Area (Acres)								
Incremental		570	3,320	4,200				
cumulative		570	3,890	8,090				
Materials								
Steel (Tons)								
Incremental			740	950	800	460		
Cumulative			740	1,690	2,490	2,950		
Concrete (CY*1,000)								
Incremental			140	180	150	90		
Cumulative			140	320	470	560		
Asphalt (TNS*1,000)								
Incremental				250	210	130		
Cumulative				250	460	590		
Aggregate (CY*1,000)								
Incremental		40	230	300	250	140		
Cumulative		40	270	570	820	960		
Prime Coat (TNS)								
Incremental				2,200	1,840	1,060		
Cumulative				2,200	1,040	5,100		
Fencing (LF*1,000)								
Incremental					40	23		
Cumulative					40	63		

Personnel numbers are yearly averages

3321-3

DDA

The total resource requirements for the DDA construction in Nevada/Utah and in Texas/New Mexico are shown in Tables 5-11 and 5-12, respectively. Except for personnel, incremental and cumulative quantities are shown for each resource. Water quantities include requirements for concrete, dust suppression, compaction, and construction personnel, but not for revegetation. Disturbed areas include construction of protective shelters and roads, but not temporary facilities such as aggregate pits, etc. Reinforcing steel and plate steel make up the steel quantities. The quantities shown for aggregate include only road construction. There is no one peak year for all of the construction resources for either Nevada/Utah or Texas/New Mexico. Tables 5-13 and 5-14 show the construction resources required for each construction group for the Nevada/Utah region and the Texas/New Mexico region, respectively.

Requirements for certain resources, such as concrete and steel, are the same for Alternative 8 (Nevada/Utah/Texas/New Mexico) and the Proposed Action (Nevada/Utah). This is because these resources as used in the construction of the protective shelters and both the deployment systems have the same total number of shelters, 4,600. Requirements for other resources, such as aggregate, vary between the two deployment systems because the total length of road systems are different.

Table 5-11. Total DDA construction resources for portion of Alternative 8, Nevada/Utah split basing.

	QUANTITY PER YEAR						
CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
Personnel[1]	121	1,9[illegible]4	6,224	6,743	6,323	4,450	1,208
Water (AF)							
Incremental	357	4,916	10,992	9,956	8,671	5,387	704
Cumulative	357	5,273	16,265	26,222	34,893	40,280	40,984
Distributed Area (Acres)							
Incremental	419	6,763	16,687	15,528	14,057	8,934	1,399
Cumulative	419	7,182	23,869	39,397	53,454	62,388	63,787
Steel (TNS)							
Incremental		2,036	35,447	50,745	50,972	40,443	15,856
Cumulative		2,036	37,483	88,229	139,201	179,644	195,500
Concrete (CY *1,000)							
Incremental		15	260	373	374	297	116
Cumulative		15	275	648	1,022	1,319	1,435
Asphalt (TNS *1,000)							
Incremental	160	983	1,007	874	256	133	
Cumulative	160	1,143	2,150	3,024	3,280	3,413	
Aggregate (CY *1,000)							
Incremental	188	3,180	6,694	5,448	4,784	2,686	
Cumulative	188	3,368	10,062	15,510	20,293	22,900	
Prime Coat (TNS)							
Incremental	587	3,593	3,681	3,195	935	488	
Cumulative	587	4,179	7,860	11,055	11,990	12,478	
Fencing (LF *1,000)							
Incremental		32	564	807	811	643	252
Cumulative		32	596	1,403	2,214	2,857	3,110
Protective Shelters							
Incremental		24	417	597	600	476	187
Cumulative		24	441	1,038	1,638	2,113	2,300
Miles of DTN Roads							
Incremental	35	211	217	188	55	29	
Cumulative	35	246	462	650	705	734	
Miles of Cluster Roads							
Incremental		331	901	722	733	413	
Cumulative		331	1,232	1,954	2,687	3,100	

[1]Personnel numbers are yearly averages.

4003-2

Table 5-12. Total DDA construction resources for portion of Alternative 8, Texas/New Mexico split basing.

	QUANTITY PER YEAR					
CONSTRUCTION RESOURCES	1984	1985	1986	1987	1988	1989
Personnel[a]	83	1,926	6,711	8,094	6,811	2,658
Water (AF)						
Incremental	245	4,918	11,991	11,146	8,984	1,782
Cumulative	245	5,163	17,154	28,300	37,284	39,066
Disturbed Area (Acres)						
Incremental	287	6,713	18,157	17,993	14,625	3,402
Cumulative	287	7,000	25,157	43,150	57,775	61,177
Steel (TNS)						
Incremental		2,365	37,388	65,101	57,278	33,369
Cumulative		2,365	39,753	104,854	162,131	195,500
Concrete (CY*1000)						
Incremental		17	274	478	420	245
Cumulative		17	292	770	1,190	1,435
Asphalt (TNS*1,000)						
Incremental	110	1,059	1,123	416	304	
Cumulative	110	1,169	2,293	2,709	3,013	
Aggregate (CY*1,000)						
Incremental	129	3,129	7,332	6,117	4,783	231
Cumulative	129	3,258	10,590	16,707	21,490	21,721
Prime Coat (TNS)						
Incremental	403	3,873	4,107	1,520	1,113	
Cumulative	403	4,276	8,383	9,903	11,016	
Fencing (LF*1,000)						
Incremental		38	595	1,035	911	531
Cumulative		38	632	1,668	2,579	3,110
Protective Shelters						
Incremental		28	440	766	674	393
Cumulative		28	468	1,234	1,907	2,300
Miles of DTN Roads						
Incremental	24	228	242	89	65	
Cumulative	24	252	493	583	648	
Miles of Cluster Roads						
Incremental		308	982	920	723	38
Cumulative		308	1,291	2,210	2,933	2,971

[a]Personnel numbers are yearly averages.

4002-2

TABLE 5-13. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8,
NEVADA/UTAH SPLIT BASING

QUANTITY PER YEAR

GROUP 1

(Page 1 of 8)

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989	1990
PERSONNEL[1]	121	998	1489	155.				
WATER (AF)								
INCREMENTAL	357	2350	1494	90.				
CUMULATIVE	357	2707	4200	4291				
DISTURBED AREA (ACRES)								
INCREMENTAL	419	3412	2594	180				
CUMULATIVE	419.	3831	6425.	6604				
MATERIALS								
STEEL (TONS)								
INCREMENTAL		2036	15477	2036.				
CUMULATIVE		2036	17514	19550.				
CONCRETE (CY×1000)								
INCREMENTAL		15	114	15.				
CUMULATIVE		15	129	144.				
ASPHALT (TONS×1000)								
INCREMENTAL	160	267						
CUMULATIVE	160	428						
AGGREGATE (CY×1000)								
INCREMENTAL	188	1592	617					
CUMULATIVE	188	1780	2400					
[illegible]								
INCREMENTAL	587	[illegible]						
CUMULATIVE	587	1564						
FENCING (FT×1000)								
INCREMENTAL		[illegible]	[illegible]	32				
CUMULATIVE		[illegible]	[illegible]	311				
PROTECTIVE SHELTERS								
INCREMENTAL		[illegible]	[illegible]	24				
CUMULATIVE		[illegible]	[illegible]	230				
[illegible]								
INCREMENTAL	[illegible]	[illegible]						
CUMULATIVE	[illegible]	[illegible]						
[illegible]								
INCREMENTAL		[illegible]	[illegible]					
CUMULATIVE		[illegible]	[illegible]					

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 5-13. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, NEVADA/UTAH SPLIT BASING.

GROUP 2

(Page 2 of 8)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989	1990
PERSONNEL[1]				218	941	1576	513	
WATER (AF)								
INCREMENTAL				640	2260	1749.	299.	
CUMULATIVE				640.	2900	4649	4948.	
DISTURBED AREA (ACRES)								
INCREMENTAL				751.	3366	2978	594.	
CUMULATIVE				751.	4117	7096	7690.	
MATERIALS								
STEEL (TONS)								
INCREMENTAL					1450	15275	6735	
CUMULATIVE					1450	16725	23460	
CONCRETE (CY×1000)								
INCREMENTAL					11	112	49	
CUMULATIVE					11	123	172	
ASPHALT CONC (1000)								
INCREMENTAL				288	135			
CUMULATIVE				288	423			
AGGREGATE (CY×1000)								
INCREMENTAL				338	1613	823		
CUMULATIVE				338	1951	2774		
PRIME COAT (TONS)								
INCREMENTAL				1052	495			
CUMULATIVE				1052	1547			
CEMENT (1000)								
INCREMENTAL					21	[illegible]	107	
CUMULATIVE					21	266	373	
PROTECTIVE SHELTERS								
INCREMENTAL					17	180	79	
CUMULATIVE					17	197	276	
[illegible]								
INCREMENTAL				[illegible]	[illegible]			
CUMULATIVE				[illegible]	[illegible]			
[illegible]								
INCREMENTAL					[illegible]	[illegible]		
CUMULATIVE					[illegible]	[illegible]		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 5-13. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, NEVADA/UTAH SPLIT BASING

QUANTITY PER YEAR

GROUP 3
(Page 3 of 8)

[illegible]	[illegible]	1984	1985	1986	1987	1988	1989	1990
RESOURCES								
[illegible][1]			70	754	1870	701		
[illegible]								
[illegible]			[illegible]	2046	2605	455		
[illegible]			[illegible]	2253	4858	5313		
[illegible] (ACRES)								
[illegible]			243	2854	4274	904		
[illegible]			243	3097	7371	8275		
[illegible]								
[illegible]								
[illegible]					15169	10247		
[illegible]					15160	25415		
[illegible]								
[illegible]					111	75		
[illegible]					111	187		
[illegible]								
[illegible]			[illegible]	337	7			
[illegible]			[illegible]	430	437			
[illegible]								
[illegible]			[illegible]	1321	1479			
[illegible]			[illegible]	1501	2980			
[illegible]								
[illegible]			[illegible]	1231	27			
[illegible]			[illegible]	1571	1599			
[illegible]								
[illegible]					241	163		
[illegible]					241	404		
PROTECTIVE SHELTERS								
[illegible]					[illegible]	[illegible]		
[illegible]					[illegible]	[illegible]		
[illegible]								
[illegible]				[illegible]	[illegible]			
[illegible]				[illegible]	[illegible]			
[illegible]				[illegible]	[illegible]			

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 5-13. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, NEVADA/UTAH SPLIT BASING

GROUP 4

(Page 4 of 8)

QUANTITY PER YEAR

[illegible] RESOURCES	1983	1984	1985	1986	1987	1988	1989	1990
[illegible][1]		41	[illegible]	2139	1201			
[illegible]								
[illegible]		127	1846	3119	1085			
[illegible]		127	[illegible]	5092	6178			
[illegible] (ACRES)								
[illegible]		149	[illegible]	4229	1926			
[illegible]		149	[illegible]	7670	9603			
[illegible]								
[illegible]								
[illegible]				16022	13253			
[illegible]				16022	29325			
[illegible]								
[illegible]				118	97			
[illegible]				118	215			
[illegible]								
[illegible]		[illegible]	[illegible]	106				
[illegible]		[illegible]	[illegible]	[illegible]				
[illegible]								
[illegible]		[illegible]	[illegible]	1771	801			
[illegible]		[illegible]	[illegible]	3081	[illegible]			
[illegible]								
[illegible]		[illegible]	[illegible]	[illegible]				
[illegible]		[illegible]	[illegible]	1921				
[illegible]								
[illegible]				[illegible]	211			
[illegible]				[illegible]	466			
PROTECTIVE SHELTERS								
[illegible]				[illegible]	[illegible]			
[illegible]				[illegible]	[illegible]			
[illegible]				[illegible]				

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 5-13. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, NEVADA/UTAH SPLIT BASING

QUANTITY PER YEAR

GROUP 5

(Page 5 of 8)

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989	1990
PERSONNEL[1]		374	1717	634				
WATER (ACRE-FT)								
INCREMENTAL		1038	2753	386				
CUMULATIVE		1038	3791	4177				
DISTURBED AREA (ACRES)								
INCREMENTAL		1383	4330	757				
CUMULATIVE		1383	5714	6471				
MATERIALS								
STEEL (TONS)								
INCREMENTAL			11342	8208				
CUMULATIVE			11342	19550				
CEMENT (TONS x 1000)								
INCREMENTAL			83	60				
CUMULATIVE			83	144				
[illegible] (TONS x 1000)								
INCREMENTAL		[illegible]	[illegible]					
CUMULATIVE		[illegible]	[illegible]					
[illegible]								
INCREMENTAL		[illegible]	[illegible]	17				
CUMULATIVE		[illegible]	[illegible]	2339				
[illegible]								
INCREMENTAL		[illegible]	[illegible]					
CUMULATIVE		[illegible]	[illegible]					
[illegible]								
[illegible]			[illegible]	131				
[illegible]			[illegible]	111				
PROTECTIVE SHELTERS								
[illegible]			[illegible]	[illegible]				

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 5-13. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, NEVADA/UTAH SPLIT BASING

GROUP 6

(Page 6 of 8)

[illegible] RESOURCES	QUANTITY PER YEAR 1983	1984	1985	1986	1987	1988	1989	1990
[illegible][1]		492	2004	1763	304			
[illegible]								
INCREMENTAL		1401	1224	1415	177			
CUMULATIVE		1401	5325	6740	6918			
[illegible] (ACRES)								
INCREMENTAL		1819	6035	2580	352			
CUMULATIVE		1819	7853	10433	10786			
[illegible]								
[illegible]								
INCREMENTAL			8628	20612	3995			
CUMULATIVE			8628	29240	33235			
[illegible]								
INCREMENTAL			43	151	29			
CUMULATIVE			43	215	244			
[illegible]								
INCREMENTAL		405	153					
CUMULATIVE		405	558					
[illegible]								
INCREMENTAL		859	2617	384				
CUMULATIVE		859	3476	3860				
[illegible]								
INCREMENTAL		1480	550					
CUMULATIVE		1480	2030					
[illegible]								
INCREMENTAL			12	320	64			
CUMULATIVE			12	465	529			
PROTECTIVE SHELTERS								
[illegible]			102	242	47			
[illegible]			102	344	391			
[illegible]			[illegible]					
[illegible]			[illegible]					

[1] PERSONNEL NUMBERS ARE YEARLY AVERAGES.

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TABLE 5-13. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, NEVADA/UTAH SPLIT BASING

QUANTITY PER YEAR

GROUP 7

(Page 7 of 8)

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989	1990
PERSONNEL [1]			260	1080.	1893.	471.		
WATER (AF)								
INCREMENTAL			768	2258.	2293.	286.		
CUMULATIVE			768	3027.	5319.	5606.		
DISTURBED AREA (ACRES)								
INCREMENTAL			956.	3406.	3844.	569.		
CUMULATIVE			956.	4362.	8206.	8775.		
MATERIALS								
STEEL (TNS)								
INCREMENTAL				3816.	17106.	6448		
CUMULATIVE				3816.	20922.	27370		
CONCRETE (CY×1000)								
INCREMENTAL				28	126.	47.		
CUMULATIVE				28	154	201.		
ASPHALT (TNS×1000)								
INCREMENTAL			275	144				
CUMULATIVE			275	419				
AGGREGATE (CY×1000)								
INCREMENTAL			443	1527	1177			
CUMULATIVE			443	1970	3147			
PRIME COAT (TNS)								
INCREMENTAL			1004	526				
CUMULATIVE			1004	1530				
FENCING (FT×1000)								
INCREMENTAL				61	272	103		
CUMULATIVE				61	333	435		
PROTECTIVE SHELTERS								
INCREMENTAL				45	201	76		
CUMULATIVE				45	246	[illegible]		
[illegible]								
INCREMENTAL				[illegible]				
CUMULATIVE				[illegible]				
[illegible]								
INCREMENTAL				[illegible]	[illegible]			
CUMULATIVE					[illegible]			

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES

TABLE 5-13. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, NEVADA/UTAH SPLIT BASING

QUANTITY PER YEAR

GROUP 8

(Page 8 of 8)

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989	1990
PERSONNEL[1]					85.	1602.	695.	
WATER (AF)								
INCREMENTAL					251.	2897.	405.	
CUMULATIVE					251.	3148.	3553.	
DISTURBED AREA (ACRES)								
INCREMENTAL					295.	4483.	805.	
CUMULATIVE					295.	4778.	5582.	
MATERIALS								
STEEL (TNS)								
INCREMENTAL						8474.	9121.	
CUMULATIVE						8474	17595.	
CONCRETE (CY×1000)								
INCREMENTAL						62.	67.	
CUMULATIVE						62.	129.	
ASPHALT (TNS×1000)								
INCREMENTAL					113.	133.		
CUMULATIVE					113.	246.		
AGGREGATE (CY×1000)								
INCREMENTAL					133.	1864.		
CUMULATIVE					133	1997.		
PRIME COAT (TNS)								
INCREMENTAL					413.	488.		
CUMULATIVE					413.	901.		
FENCING (LF×1000)								
INCREMENTAL						135	145.	
CUMULATIVE						135.	280.	
PROTECTIVE SHELTERS								
INCREMENTAL						100	107	
CUMULATIVE						100	207.	
[illegible]								
INCREMENTAL					24	[illegible]		
CUMULATIVE					24	[illegible]		
[illegible]								
INCREMENTAL						[illegible]		
CUMULATIVE						[illegible]		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 5-14. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, TEXAS/NEW MEXICO SPLIT BASING.

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]		83.	1221.	1933.			
WATER (AF)							
INCREMENTAL		245.	2905.	1784.			
CUMULATIVE		245.	3150.	4935.			
DISTURBED AREA (ACRES)							
INCREMENTAL		287.	4190.	3152.			
CUMULATIVE		287.	4477.	7629.			
MATERIALS							
STEEL(TNS)							
INCREMENTAL			2365.	21095.			
CUMULATIVE			2365.	23460.			
CONCRETE(CY*1000)							
INCREMENTAL			17	155			
CUMULATIVE			17.	172.			
ASPHALT(TNS*1000)							
INCREMENTAL		110.	364.				
CUMULATIVE		110.	474.				
AGGREGATE(CY*1000)							
INCREMENTAL		129.	1956.	651.			
CUMULATIVE		129.	2085.	2736.			
PRIMECOAT(TNS)							
INCREMENTAL		403.	1331.				
CUMULATIVE		403.	1734.				
FENCING(LF*1000)							
INCREMENTAL			38.	336.			
CUMULATIVE			38.	373.			
PROTECTIVE SHELTERS							
INCREMENTAL			28.	248			
CUMULATIVE			28	276.			
MILES OF DTN ROADS							
INCREMENTAL		24	78				
CUMULATIVE		24	102				
MILES OF CLUSTER RD							
INCREMENTAL			250	106.			
CUMULATIVE			250.	356.			

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

GROUP 2
(PAGE 2 OF 7)

TABLE 5-14. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, TEXAS/NEW MEXICO SPLIT BASING.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR 1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]			430	1837	1758.		
WATER (AF)							
INCREMENTAL			1234.	3590.	1274.		
CUMULATIVE			1234.	4824.	6099		
DISTURBED AREA (ACRES)							
INCREMENTAL			1527.	5549.	2382.		
CUMULATIVE			1527	7075.	9458.		
MATERIALS							
STEEL(TNS)							
INCREMENTAL				7884.	21441		
CUMULATIVE				7884.	29325.		
CONCRETE(CY*1000)							
INCREMENTAL				58.	157.		
CUMULATIVE				58.	215.		
ASPHALT(TNS*1000)							
INCREMENTAL			453.	105.			
CUMULATIVE			453.	558.			
AGGREGATE(CY*1000)							
INCREMENTAL			705.	2432	247.		
CUMULATIVE			705.	3137.	3385.		
PRIMECOAT(TNS)							
INCREMENTAL			1658.	383.			
CUMULATIVE			1658.	2040.			
FENCING(LF*1000)							
INCREMENTAL				125.	341.		
CUMULATIVE				125.	466.		
PROTECTIVE SHELTERS							
INCREMENTAL				93.	252.		
CUMULATIVE				93.	345.		
MILES OF DTN ROADS							
INCREMENTAL			98	23			
CUMULATIVE			98	120.			
MILES OF CLUSTER RD							
INCREMENTAL			28	377	40		
CUMULATIVE			28	406	446.		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 5-14. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8,[1] TEXAS/NEW MEXICO SPLIT BASING.

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL [1]				679.	1982.	1504	
WATER (AF)							
INCREMENTAL				1945.	3566.	1002.	
CUMULATIVE				1945.	5511.	6513.	
DISTURBED AREA (ACRES)							
INCREMENTAL				2417.	5611.	1916.	
CUMULATIVE				2417.	8028.	9943.	
MATERIALS							
STEEL(TNS)							
INCREMENTAL					10394.	18931.	
CUMULATIVE					10394.	29325.	
CONCRETE(CY*1000)							
INCREMENTAL					76.	139.	
CUMULATIVE					76.	215.	
ASPHALT(TNS*1000)							
INCREMENTAL				700.	44.		
CUMULATIVE				700.	744.		
AGGREGATE(CY*1000)							
INCREMENTAL				1119.	2360.	124.	
CUMULATIVE				1119.	3480.	3603.	
PRIMECOAT(TNS)							
INCREMENTAL				2561.	159.		
CUMULATIVE				2561.	2720.		
FENCING(LF*1000)							
INCREMENTAL					165.	301.	
CUMULATIVE					165.	466.	
PROTECTIVE SHELTERS							
INCREMENTAL					122.	223.	
CUMULATIVE					122.	345.	
MILES OF DTN ROADS							
INCREMENTAL				151.	9.		
CUMULATIVE				151.	160.		
MILES OF CLUSTER RD							
INCREMENTAL				48.	377.	20.	
CUMULATIVE				48.	426.	446.	

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES

TABLE 5-14. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, TEXAS/NEW MEXICO SPLIT BASING.

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]					433.	2100.	1251.
WATER (AF)							
INCREMENTAL					1189.	3477.	729.
CUMULATIVE					1189.	4666.	5395.
DISTURBED AREA (ACRES)							
INCREMENTAL					1622.	5562.	1449.
CUMULATIVE					1622.	7183.	8632.
MATERIALS							
STEEL(TNS)							
INCREMENTAL						12905.	16420.
CUMULATIVE						12905.	29325.
CONCRETE(CY*1000)							
INCREMENTAL						95.	121.
CUMULATIVE						95.	215
ASPHALT(TNS*1000)							
INCREMENTAL					242.		
CUMULATIVE					242.		
AGGREGATE(CY*1000)							
INCREMENTAL					783.	2230.	
CUMULATIVE					783.	3013.	
PRIMECOAT(TNS)							
INCREMENTAL					884		
CUMULATIVE					884		
FENCING(LF*1000)							
INCREMENTAL						205.	261.
CUMULATIVE						205	466.
PROTECTIVE SHELTERS							
INCREMENTAL						152.	193
CUMULATIVE						152	345
MILES OF DTN ROADS							
INCREMENTAL					52		
CUMULATIVE					52		
MILES OF CLUSTER RD							
INCREMENTAL					82	364	
CUMULATIVE					82	446	

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 5-14. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, TEXAS/NEW MEXICO SPLIT BASING.

GROUP 5
(PAGE 5 OF 7)

QUANTITY PER YEAR

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]			275.	1915.	1875.		
WATER (AF)							
INCREMENTAL			778	3700.	1359.		
CUMULATIVE			778	4478	5837.		
DISTURBED AREA (ACRES)							
INCREMENTAL			997	5765.	2540.		
CUMULATIVE			997	6762.	9302.		
MATERIALS							
STEEL(TNS)							
INCREMENTAL				8409.	22871.		
CUMULATIVE				8409	31280.		
CONCRETE(CY*1000)							
INCREMENTAL				62.	168.		
CUMULATIVE				62	230.		
ASPHALT(TNS*1000)							
INCREMENTAL			242.	56			
CUMULATIVE			242	298.			
AGGREGATE(CY*1000)							
INCREMENTAL			468.	2525.	263.		
CUMULATIVE			468.	2993.	3256.		
PRIMECOAT(TNS)							
INCREMENTAL			884	204			
CUMULATIVE			884	1088			
FENCING(LF*1000)							
INCREMENTAL				134.	364.		
CUMULATIVE				134	498.		
PROTECTIVE SHELTERS							
INCREMENTAL				99.	269		
CUMULATIVE				99	368		
MILES OF DTN ROADS							
INCREMENTAL			52	12.			
CUMULATIVE			52	64			
MILES OF CLUSTER RD							
INCREMENTAL			30	402.	43.		
CUMULATIVE			30.	432.	475		

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

GROUP 6

(PAGE 6 OF 7)

TABLE 5-14. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, TEXAS/NEW MEXICO SPLIT BASING.

CONSTRUCTION RESOURCES	1983	1984	1985	1986	1987	1988	1989
	QUANTITY PER YEAR						
PERSONNEL[1]				347.	1961.	1504.	
WATER (AF)							
INCREMENTAL				971.	3505.	1002.	
CUMULATIVE				971.	4476.	5478.	
DISTURBED AREA (ACRES)							
INCREMENTAL				1274.	5540.	1916.	
CUMULATIVE				1274.	6814.	8729.	
MATERIALS							
STEEL(TNS)							
INCREMENTAL					10394.	18931.	
CUMULATIVE					10394.	29325.	
CONCRETE(CY*1000)							
INCREMENTAL					76.	139.	
CUMULATIVE					76.	215.	
ASPHALT(TNS*1000)							
INCREMENTAL				263.	16.		
CUMULATIVE				263.	279.		
AGGREGATE(CY*1000)							
INCREMENTAL				605.	2328.	124.	
CUMULATIVE				605.	2934.	3057.	
PRIMECOAT(TNS)							
INCREMENTAL				960.	60.		
CUMULATIVE				960.	1020.		
FENCING(LF*1000)							
INCREMENTAL					165.	301.	
CUMULATIVE					165.	466.	
PROTECTIVE SHELTERS							
INCREMENTAL					122.	223.	
CUMULATIVE					122.	345.	
MILES OF DTN ROADS							
INCREMENTAL				56.	4.		
CUMULATIVE				56.	60.		
MILES OF CLUSTER RD							
INCREMENTAL				48	377.	20.	
CUMULATIVE				48.	426.	446.	

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

TABLE 5-14. TOTAL DDA CONSTRUCTION RESOURCES BY GROUP FOR PORTION OF ALTERNATIVE 8, TEXAS/NEW MEXICO SPLIT BASING.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR 1983	1984	1985	1986	1987	1988	1989
PERSONNEL[1]					86.	1702.	1407.
WATER (AF)							
INCREMENTAL					254.	3503.	1053.
CUMULATIVE					254.	3757.	4810.
DISTURBED AREA (ACRES)							
INCREMENTAL					298.	5232.	1953.
CUMULATIVE					298.	5530.	7484.
MATERIALS							
STEEL(TNS)							
INCREMENTAL						6511.	16949.
CUMULATIVE						6511.	23460.
CONCRETE(CY*1000)							
INCREMENTAL						48.	124.
CUMULATIVE						48.	172.
ASPHALT(TNS*1000)							
INCREMENTAL					114.	304.	
CUMULATIVE					114.	419.	
AGGREGATE(CY*1000)							
INCREMENTAL					134.	2305.	231.
CUMULATIVE					134.	2439.	2670.
PRIMECOAT(TNS)							
INCREMENTAL					417.	1113.	
CUMULATIVE					417.	1530.	
FENCING(LF*1000)							
INCREMENTAL						104.	270.
CUMULATIVE						104.	373.
PROTECTIVE SHELTERS							
INCREMENTAL						77.	199.
CUMULATIVE						77.	276.
MILES OF DTN ROADS							
INCREMENTAL					25.	65.	
CUMULATIVE					25.	90.	
MILES OF CLUSTER RD							
INCREMENTAL						318.	38.
CUMULATIVE						318.	356.

[1]PERSONNEL NUMBERS ARE YEARLY AVERAGES.

APPENDIX 6

ARMY CORPS OF ENGINEERS CONCEPTUAL
CONSTRUCTION SEQUENCING

1. M-X operational construction sequential DDA development.
2. M-X EIS construction sequence concurrent development.
3. M-X EIS construction sequence Texas/New Mexico.

OVERVIEW
MX Operational Construction
Sequential DDA Development

The Sequential Development Approach described herein is based on the preferred "precast concept" of shelter construction. The precast concept centralizes the production of precast concrete protective structure segments thereby reducing the number of construction personnel at each shelter site.

Precast plant logistical studies indicate that seven precast facilities can produce the required segments for the total number of shelters to be constructed. Each precast plant, supported by adjacent "main" construction camps and aggregate quarries, is appropriately sited to support the construction of groups of shelters in a general geographical area. Additional "satellite" camps to house field construction personnel will be located in areas remote from the precast plants.

The Sequential Development Approach initiates Operational MX Facility Subsystem Construction in one location and progressively extends the construction area to complete shelters in accordance with MX deployment schedules. The Designated Transportation Network (DTN) provides the interconnecting link for construction material/equipment supply from railheads on commercial railroads and for operational missile deployment from the OB/DAA. A schematic diagram of the approach is shown in Figure 1.

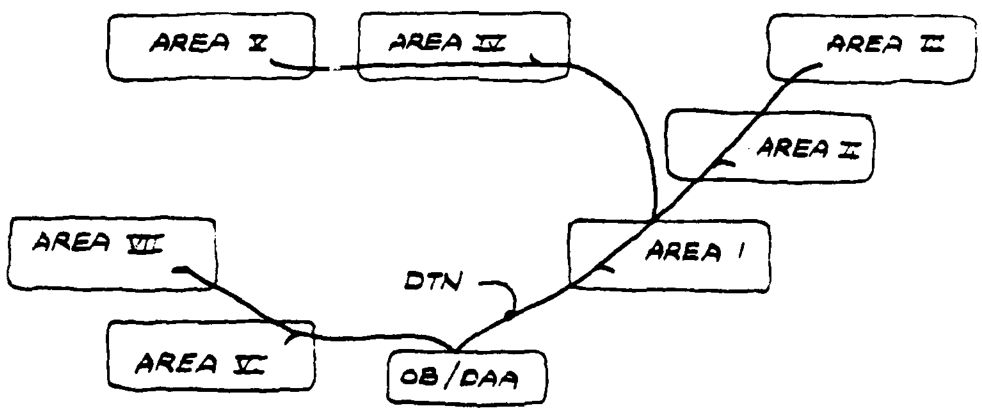


Figure 1. Schematic Diagram of Sequential Development

Although it is possible to locate the initial effort (Area I) in any of the designated valley areas, the Dry Lake Valley geographical area has been established as the preferred first development area in the construction scenario presented hereinafter. This area has an available railhead at Pioche, Nevada and, for initial missile deployment, is in close proximity to the OB/DAA proposed for Beryl, Utah.

The Sequential Devleopment Approach uses DTN road construction (base course provides construction roads) to open-up areas of shelter construction and provide a specific route for construction traffic. Aggregate plants and water wells supporting DTN construction will be located along the DTN route at intervals of approximately 30 miles. A schematic of initial construction into Area I is shown in Figure 2.

Step 1 - Construct marshalling yard at railhead
Step 2 - Establish DTN alignment
Step 3 - Construct water wells
Step 4 - Open aggregate quarries
Step 5 - Construct DTN (base course)

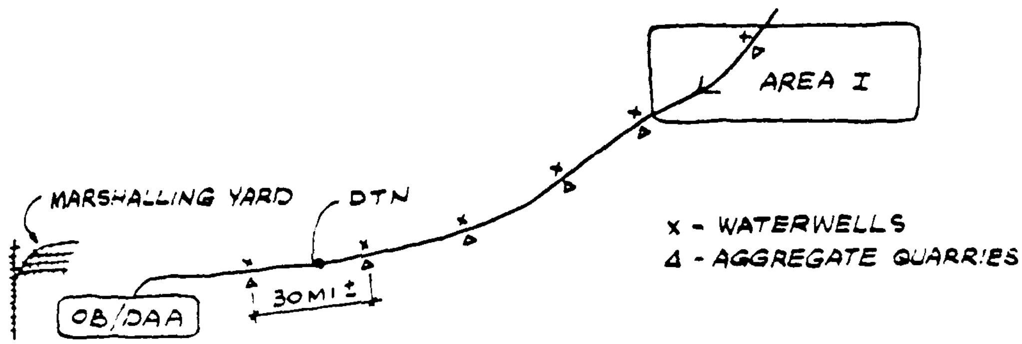


Figure 2. Sequencing Initial Construction

The first leg of the DTN opens Area I for mobilization (precast plant, aggregate quarries, water wells and construction camps) and shelter construction. As shelters in Area I are being constructed, the DTN will be extended to open subsequent areas of shelter construction as required to meet scheduled completion dates. Figure 3 shows subsequent construction as sequential development progresses.

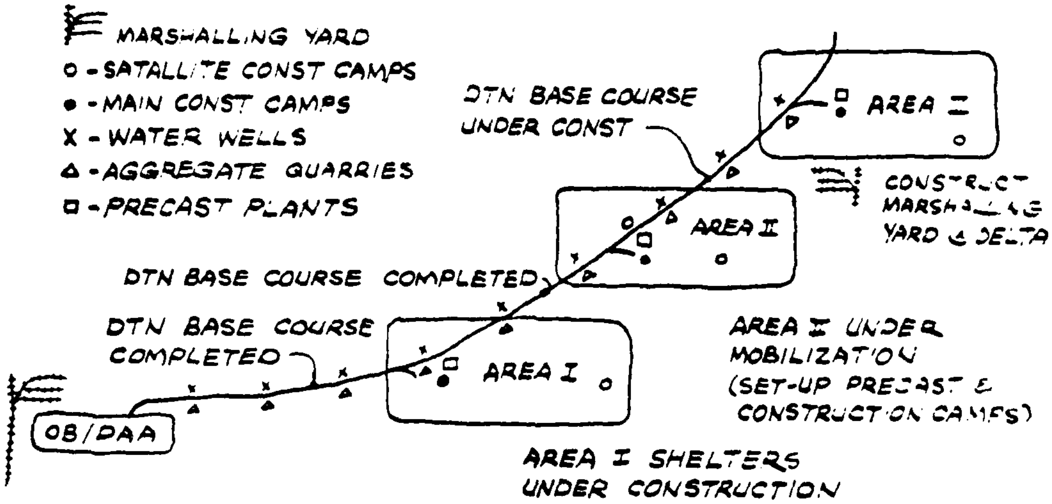


Figure 3. Subsequent Construction

Table 1 identifies the activities/events (by calendar year) of the sequential development approach extended through all seven geographical locations to meet scheduled shelter completion dates. As shown in Table 1, this approach uses sequenced precast plants, construction camps and marshalling yards to maximize support facility utilization, minimize contractor interferences, and avoid missile deployment activities. Figure 4 shows the staging of construction support facilities including the relocation of precast plants.

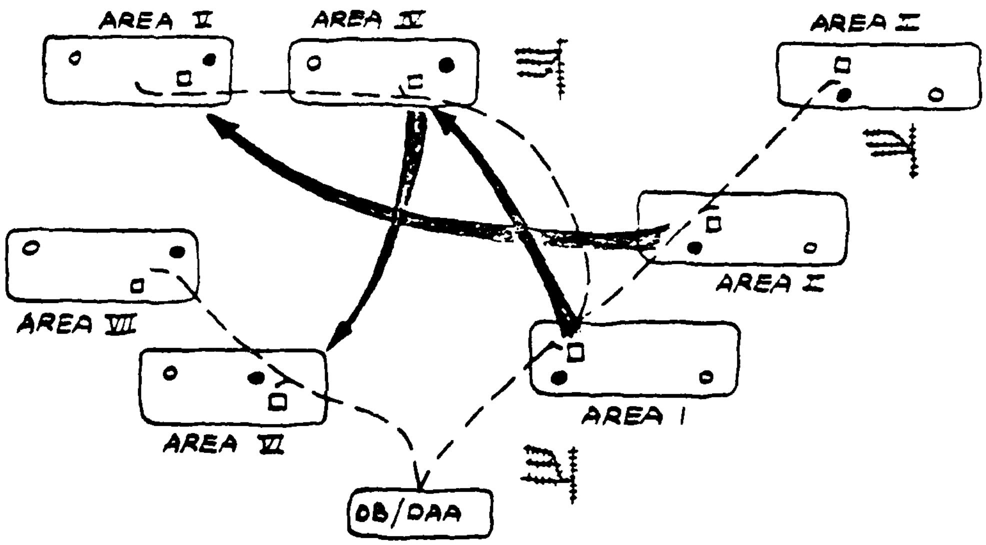


Figure 4. Staging Construction Support Facilities

Table 1. Yearly Activities/Events

	CY 1983	CY 1984	CY 1985	CY 1986	CY...
AREA I	o Construct marshalling yard at Pioche, Nevada o Construct water wells and storage tanks for camps and road constr. o Open aggregate quarries for road construction o Construct DTN roads o Construct Construction camps	o Connect to existing water system to support precast plant o Open aggregate quarries to support precast plant o Set up precast plant and begin production o Begin construction of sitework and horizontal shelters	o Complete 230 shelters & turnover for A & CO o Continue cluster road and sitework o Continue horizontal shelter construction	o Complete balance of shelters in Area I o Construct final DTN surface o Relocate precast plant to Area IV	
AREA II		...	...	... o Complete 820 shelters and turnover for A & CO	
AREA III		o Start marshalling yard at Delta, Utah o Develop water wells for Area III camps and road construction o Construct DTN roads	o Complete marshalling yard at Delta, Utah o Open aggregate quarries o Start set-up batch & precast plants o Construct Construction camps	o Complete batch & precast o Start shelter production & installation	
AREA ...					

NOTE: CY 1987, 1988, 1989 & AREA III, V, VI, & VII TO COME LATER.

The contracting strategy in the Sequential Development Approach calls for support facilities construction and operations contractor(s), DTN construction and maintenance contractor(s), and primary shelter construction contractor(s). The approach is flexible enough to permit various alternatives or combinations of contracting strategies.
As a baseline, the following is being used for Operational Construction planning purposes:

1. Contractor(s) for construction and operation of all support facilities (water wells, aggregate quarries, marshalling yards, precast plants, construction camps). Water, aggregate, and precast concrete segments (including cement, fly ash, reinforcing) will be "Government Furnished" under these contracts.

2. Contractor(s) for DTN construction and maintenance with road interfaces at the OB/DAA site boundary and at area precast plants.

3. Contractor(s) for shelter construction including shelter roads, linear grid roads and DTN trunk roads.

The number of contracts depends on the size of contracts selected to optimize construction management, competitive bidding, and work force utilization. In general, however, the Sequential Development Approach will allow flexible packaging of contracts.

M-X EIS

CONSTRUCTION SEQUENCE

CONCURRENT DEVELOPMENT

The Concurrent Development Sequence of construction is an alternative which will lessen the impact of the effort upon the socio-economic, transportation and environmental resources of the region. As with other alternative construction sequences, the concurrent development alternative is scoped to meet the IOC and FOC completion dates, which are considered to be firm. Any modification of the schedule will be reflected in either the IOC or FOC dates.

The specific location of the initial effort will be dependent upon the location of the principal, or first, Operating Base. Within the Operating Base, there will be a contractors' support camp to be built in FY82. At the same time, construction roads and water wells must be started into the initial group of clusters, as well as the building of a construction camp in this area near the Operating Base and construction of a marshalling yard at the closest railhead. These are the basic initial activities necessary during FY82 to meet the IOC deadline.

The next effort will begin in FY83 in the establishment of concrete facilities for either precast or cast-in-place activities in the area containing the first group of shelters. Also, during FY83 work would commence in three other areas of the region with the development of marshalling yards, construction camps and precast facilities or storage facilities for steel, cement, sand and gravel for cast-in-place shelters. Concurrently, the construction of the road system into an adjacent valley and its clusters will begin, providing access to each shelter road. All future construction would proceed in an orderly manner during succeeding Fiscal Years from these four areas. In order to accomplish this effort, it is planned to build construction camps within or adjacent to the group of valleys.

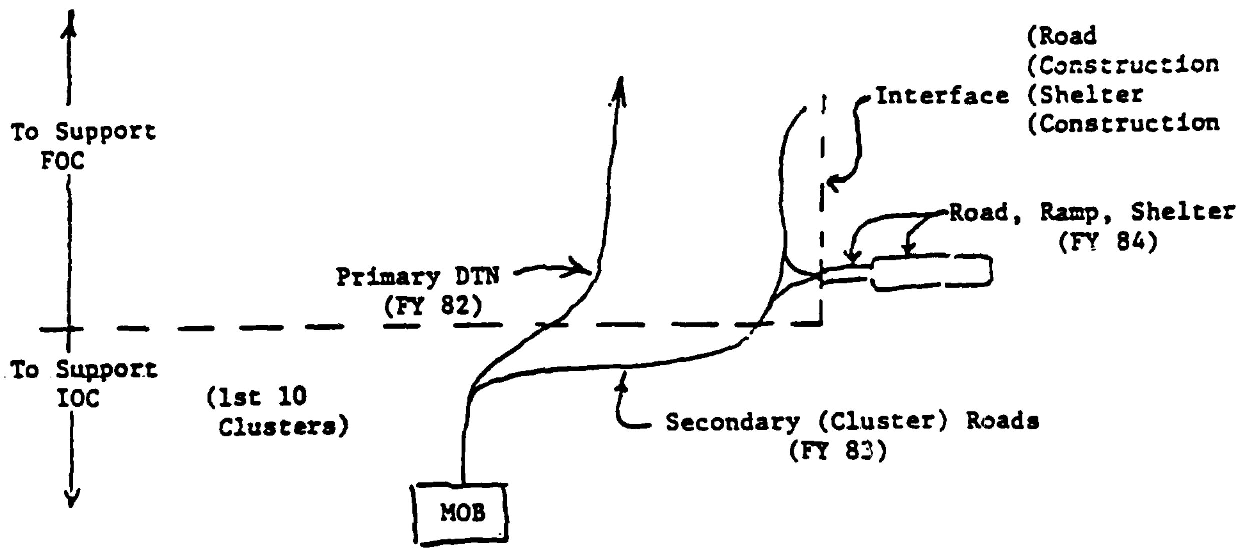
The impacts of construction will thus be spread over four areas of the region. This would reduce the severity of the impacts upon items such as community cohesiveness, public services, economic stability, water and natural resources as well as the entire transportation, and supply system.

The general descriptions above are considered applicable regardless of the location of the Operating Base. However, in order to be more definitive, some basic assumptions are discussed below.

In order to accomplish the construction necessary to meet the immediacy of the IOC and the slightly longer term FOC, every effort must be made to be ready to start constructing shelters in FY84. Such shelter construction requires that FY82-83 preparatory construction contracts be effected if access to the work areas for equipment, personnel and material is to be provided. Meeting the two goals of (1) optimum use of resources in the construction area, and (2) the least impact to the social, economic and environmental resources will require a reduced density over a larger area. Therefore, a deployment to two separate areas during FY82 are considered appropriate to obtain the best use of supply facilities and utilities, followed in FY83 with two additional work centers. Accordingly, DTN, construction camps, and marshalling yards are to be provided under the FY82-83 programs.

In the event that limited funding precludes full preparation as described above during FY82, it will be necessary to concentrate upon supporting the IOC (1st 10 clusters). The sketch below illustrates each of these efforts:

SCHEMATIC FOR INITIAL DEPLOYMENT



The construction of the Primary DTN, from the MOB through the first Deployment Area, marshalling yard, and Construction Contractor Support Camps must be completed in FY82. This is an ongoing effort into new Deployment Areas each succeeding Fiscal Year. The next sequence of events will be the construction of Secondary (Cluster) roads, Pre-Cast-Plant etc. in the 1st Deployment Area and construction of additional facilities including more marshalling yards in succeeding deployment areas during FY83. These actions will be repeated during succeeding Fiscal Years as new Deployment Areas are opened up by the DTN. This will be followed in FY84 by the building of Shelters in the 1st Deployment Area. This is shown in the following Table.

TABLE I

INITIAL CONSTRUCTION

FY82	FY83	FY84
Primary DTN - MOB thru 1st Deployment Area	Secondary Roads	Shelter Construction
Const. Contractor Support Camps	1st Deployment Area	1st Deployment Area
1 at MOB	Pre-Cast Plant	DTN Continuation - New Areas
1 in 1st Deployment Area Marshalling Yard	Marshalling Yards	Const. Camps - New Areas
	Power and Comm.	Secondary Roads - New Areas
	DTN (Cont.) New Areas	Marshalling Yards - New Areas etc.
	Const. Camps New Areas	

For succeeding Fiscal Years the amount of construction activities is directly dependent upon the number of shelters programmed in each fiscal year. Therefore, all the items shown in TABLE I under FY82 must be started two years prior to construction of the shelters. Similarly, all items listed under FY83 must be started one year before the shelters are started in each area.

The basic factors which entered into determining the construction sequence are listed below:

1. The DTN/Secondary routes will be used as construction access roads and will consist of a sub base without a surface and will be completed prior to need of road by subsequent contractors.

2. Access will be provided for the shelter construction contractor to each shelter site in his contract. (Eliminated cross-country uncontrolled haul road routes by several contractors.)

3. Provides routes, on a road bed, for pre-cast transporter to deliver pre-cast sections to stockpile at each shelter site. At the same time, these routes will be utilized for delivery of all other materials and buses for transporting workers.

4. Road work requires greater amounts of water. Therefore, road contractors would drill water wells at intervals within valleys. Wells would then be utilized later by other construction contractors - but pumped at lesser rates.

5. Power and communications will be constructed in road right-of-way, and will be in place when shelters are turned over to Weapons System Contractor for Installation and Check-out.

6. In support of IOC (and later), SACSO vehicles carrying components of the missile between DAA and DDA can utilize unsurfaced DTN.

7. Construction Contractor Support camps must be set up by the support contractor. Initially, one is required at the MOB, and one in the First Deployment Area. In the Deployment Area, location of support camp will be centrally located, adjacent to pre-cast plant/marshalling area.

8. This sequence should result in significant savings in construction contract bids (mobilization costs reduced--access roads, water wells in proximity already available.)

The sequencing described above will allow an orderly approach for; opening up new valleys and providing construction access, allow flexibility in setting up design and construction packages, provide a means for opening up additional deployment areas, utilizing additional supply routes (for both people and materials), and spreading the impacts more widely thus lessening the adverse effects.

One of the driving forces in the sequencing of construction will be the availability of water and the ability of obtaining a permit for its use. The amounts of water necessary will vary dependent upon the activity. However, the amounts of water required for dust control on the road network exceed all other requirements by orders of magnitude. The magnitude of the quantities required for this purpose dictate the use of dust palliatives as a means of reducing water use. Road construction requires the next highest water demand, followed by shelter backfill. With this Concurrent Development sequencing, these water demands would not be concurrent, but would be phased in succeeding construction seasons, e.g., DTN road in FY 1, cluster roads in FY 2 and shelter construction in FY 3. Thus permitting some of the wells to be pumped at lesser rates over a longer period of time. Quantities of water required for domestic water at the construction camps are comparatively insignificant and will not be pumped at as large a rate as those needed for road and shelter construction.

Incorporating water wells into the construction sequencing indicate the following:

a. 1st fiscal year (construction season): Construct primary DTN, unpaved: The DTN road contractor would drill wells at intervals under his contract to provide water for road construction. Assume a variable interval from 10 to 30 miles dependent upon availability of water well locations. Wherever possible, these wells would serve other contractors in later fiscal years (construction seasons).

b. 2nd fiscal year (construction season) construct secondary cluster roads: The cluster road contractor would drill additional wells under his contract as needed, perhaps one well for every two clusters, to provide water for road construction. These wells would then be in place to serve the shelter contractors, including the potential for a portable batch plant for the cast-in-place option.

c. 3rd fiscal year (construction season) construct shelters: The shelter construction contractors would utilize the same wells previously drilled by the road contractors in the cluster proximity.

The advantages of this sequencing program as related to the water resource are: 1. providing water in the proximity of the shelter sites; 2.reducing peak demands on each well by spreading water requirements over more than one construction season (roads/shelters); 3. is compatible with the cast-in-place option and may ease permitting by virtue of the fact that well locations can be pinpointed earlier in the design process (along road routes and cluster locations).

MX - EIS

CONSTRUCTION SEQUENCE

TEXAS-NEW MEXICO

This sequencing is scoped to meet the IOC and FOC completion dates, which are considered to be firm. Any modification of the schedule will result in a change to either the IOC or FOC dates.

The specific location of the initial effort will be dependent upon the location of the principal, or first Operating Base. Within the Operating Base, there will be a contractors support camp built in FY-82. At the same time, construction roads and water wells must be started into the initial group of clusters. A marshalling yard for transhipment of material will be located during the first year. The accommodation of the construction force will result in impacts upon items such as community cohesiveness, public services, economic stability, water and natural resources as well as the entire transportation and supply system.

In order to accomplish the construction necessary to meet the immediacy of the IOC and the slightly longer term FOC, every effort must be made to be ready to start constructing shelters in FY-84. Such a shelter construction schedule requires that FY 82-83 preparatory construction contracts for roads and communications be effected if access to the work areas for equipment, personnel and material is to be provided.

The following presents not only the Construction Sequence but also some basic data and construction notes considered pertinent for this discussion.

A. Construction Sequence (200 Clusters)

1. Parameters

a. Construct 200 clusters.

b. Start construction in following sequence:

FY-84	26 clusters
FY-85	28 clusters
FY-86	38 clusters
FY-87	69 clusters
FY-88	39 clusters

c. Complete 10 clusters (minimum) by Jan 85.

2. Assumptions

a. Construct 100 clusters in each state.

b. Limited roadway construction to start in FY-82.

c. For ease of reference and in conformance with funding sequence in A.1.b. above, clusters are assimilated in five groups as shown on attached sketch. Obviously, many other grouping arrangements are possible. As sequenced, construction begins closest to Cannon AFB and proceeds in an orderly counter-clockwise direction. Because of the multiplicity of highways, the prospect of interference between contractors is small.

3. FY 80-81

Concerted effort regarding title search, property survey, negotiations, condemnations, and all other operations related to real estate acquisition.

4. FY-82

a. Enlarge Cannon AFB, construct MAB, OBTS, and complete MOB facilities. Cannon AFB appears to be a superior selection as an MOB location due to rail service, the juncture of U.S. highways 60, 70 and 84, and its proximity to a majority of the 200 clusters. One hundred twenty (120) clusters encircle and are within 75 miles of Cannon AFB.

b. Establish marshalling yard at Cannon AFB. Considering that (1) the average haul distance from Cannon to 120 clusters is 35 miles over flat terrain, (2) there are excellent secondary and tertiary road systems, and (3) there are rail systems in four directions, a single, large, all-encompassing marshal yard should suffice for the construction of the 120 clusters in Groups I, II, III, and V.

c. Set up quarry operations to produce flexible base material and concrete aggregates for Groups I and II clusters.

d. Establish life support facilities southwest of Cannon AFB near Elida, New Mexico. The impact upon available housing and other life support facilities will be greatest during the construction of New Mexico sites, which are farthest from the large population centers. Facilities at Elida would receive support from Clovis, NM (40 miles) and Roswell, NM (65 miles) and would be convenient to construction of Groups I, II, and III.

e. Construct DTN roads to Group I (26 clusters in New Mexico). There are state highways which meet configuration requirements leading from Cannon AFB and from U.S. 60 to Group I clusters.

5. FY-83

   a. Construct DTN roads to Group II (28 clusters in New Mexico).

   b. Construct cluster roads Group I.

6. FY-84

   a. Construct Group I shelters (26 x 23).

   b. Construct Group II cluster roads.

   c. Construct DTN to Group III (15 clusters in NM - 23 in TX).

   d. Provide for the production of flexible base materials and concrete aggregates around and west of Dalhart, TX.

   e. Construct secondary operating base with all contingent features near Dalhart, TX.

   f. Establish marshalling yard near Dalhart, TX for northern 80 clusters.

7. FY-85

   a. Construct Group II shelters (28 x 23).

   b. Construct Group III cluster roads.

   c. Construct DTN roads to Group IV (69 of 80 clusters: 31 in NM - 49 in TX).

8. FY-86

   a. Construct Group III shelters (38 x 23).

   b. Construct Group IV cluster roads.

   c. Construct DTN roads to Group V (11 from Group IV - 28 in TX - Group V).

9. FY-87

   a. Construct Group IV shelters (69 x 23).

   b. Construct Group V cluster roads.

10. FY-88

    Construct Group V shelters (39 x 23).

B. Construction Sequence (100 Clusters)

1. Parameters

a. Construct 100 clusters.

b. Start construction in following sequence:

FY-84	13 clusters
FY-85	14 clusters
FY-86	19 clusters
FY-87	35 clusters
FY-88	19 clusters

c. Complete 10 clusters (minimum) by Jan 85.

2. Assumptions

a. Construct 50 clusters in each state.

b. Limited roadway construction to start in FY-82.

c. For ease of reference and in conformance with funding sequence in B.1.b. above, clusters are assimilated in five groups as shown on attached sketch. Obviously, many other grouping arrangements are possible. As sequenced, construction begins closest to Cannon AFB and proceeds in an orderly counter-clockwise direction. Because of the multiplicity of highways, the prospect of interference between contractors is small.

3. FY 80-81

a. Concerted effort regarding title search, property survey, negotiations, condemnations, and all other operations related to real estate acquisition.

b. Accelerated E&D effort to meet compressed scheduling of advertisement and award of construction contracts for FY-82.

4. FY-82

a. Enlarge Cannon AFB, construct MAB, OBTS, and complete MOB facilities. Cannon AFB appears to be a superior selection as an MOB location due to rail service, the juncture of U.S. highways 60, 70 and 84, and its proximity to 100 clusters (50 in each state), all within 75 miles and in a circular pattern around Cannon AFB.

b. Establish marshalling yard at Cannon AFB. Considering that (1) the average haul distance from Cannon to 100 clusters is

35 miles over flat terrain, (2) there are excellent primary, secondary, and tertiary road systems, and (3) there are rail systems in four directions, a single, large, all-encompassing marshal yard should suffice for the construction of the 100 clusters.

c. Set up quarry operations to produce flexible base material and concrete aggregates for Groups I, II and III clusters.

d. Establish life support facilities southwest of Cannon AFB near Elida, New Mexico, if required. The impact upon available housing and other life support facilities will be greatest during the construction of New Mexico sites, which are farthest from the large population centers. Facilities at Elida would receive support from Clovis, NM (40 miles) and Roswell, NM (65 miles) and would be convenient to construction of Groups I and II.

e. Construct DTN roads to Group I (13 clusters in New Mexico). There are state highways which meet configuration requirements leading from Cannon AFB and from U.S. 60 and U.S. 70 to Group I clusters.

5. FY-83

a. Construct DTN roads to Group II (14 clusters in New Mexico).

b. Construct cluster roads Group I.

6. FY-84

a. Construct Group I shelters (13 x 23).

b. Construct Group II cluster roads.

c. Construct DTN to Group III (4 clusters in NM - 15 in TX).

d. Provide for the production of flexible base materials and concrete aggregates north of Clovis, NM.

e. Provide life support services in the NE quadrant, if required, near Frione or Hereford, TX.

f. Establish a second marshalling yard near Hereford, TX, if required.

7. FY-85

a. Construct Group II shelters (14 x 23).

b. Construct Group III cluster roads.

c. Construct DTN roads to Group IV (35 clusters in TX).

8. FY-86

a. Construct Group III shelters (19 x 23).

b. Construct Group IV cluster roads.

c. Construct DTN roads to Group V (19 clusters in New Mexico).

9. FY-87

a. Construct Group IV shelters (35 x 23).

b. Construct Group V cluster roads.

10. FY-88

Construct Group V shelters (19 x 23).

C. Construction Notes

1. This plan addresses the establishment of two major marshalling yards for the receipt, storage, and dissemination of Government-furnished materials and equipment, and for contractor logistical usage. The contractor would have the latitude to establish other intermediate marshalling locations for his own usage.

2. The number and location of quarries being operated should be the operating contractor's prerogative, and hence a matter of economics, becoming a function of moving expense between quarries versus Rail distance.

3. A survey of current and near future (5 years) availability of cement (including low-alkali) should be made to determine the feasibility or necessity of Government stockpiling and furnishing of cement and steel.

4. There are a number of shut-down air bases in the general area, namely Webb AFB at Big Spring, Walker AFB at Roswell, etc. which may become usable as operating bases or marshalling yards in the event of a significant shift in cluster location.

5. Dust Control

a. Dust control measures will be necessary during construction for safety and physiological reasons. It should be noted, however, that the New Mexico-Texas High Plains area is extremely prone to continuous and unobstructed winds, which, together with sandy, silty and arid soil conditions, result in frequent sand and dust storms.

b. Accordingly, dust and sand drifts may be expected to accumulate in depressed areas and at shelter entrances creating a continuing maintenance problem.

D. Roads

1. New Roads

a. Construction of the DTN should be stage construction. Ideally, roadways should be built to top of base course, wrapped up with an emulsion seal as a dust palliative, and opened to construction traffic for compaction. For rapid construction, ease of repair, and economy, a double bituminous surface treatment is recommended for surfacing.

b. Subgrade soil conditions range from predominantly CL materials, with Liquid Limits ranging from 35-50, west of Amarillo, to sandy CL material and clayey sand (LL = 20-30) southward towards Lubbock and Cannon AFB. Both the Corps of Engineers and the Texas Highway Department have utilized lime-stabilization of these subgrade materials on construction projects in this area.

2. Existing Roads

a. Examination of large-scaled County road maps reflect a definite pattern regarding the secondary paved roads and the tertiary graded and drained open-surfaced roads in the project area in Texas; these roads are orientated North-South and/or East-West in practically every instance, and are usually located along "section" (one square mile) lines or multiples of section lines. In the more northerly counties, the roads are less extensive with much larger distances (10 miles or more) between roads in some areas. Some southerly counties, however, are practically covered with a highly developed network of N-S and E-W roads one mile apart in each direction.

b. Superimposing cluster roads over these county roads indicate 10 to 20 new road crossings per cluster. Assuming an average of 15 new road crossings per cluster, and 2 new drainage structures per crossing, an order of magnitude of 6,000 new drainage structures would be indicated and would be required. Additional drainage structures will be needed where DTN roads intersect existing roads, and where new roads block significant drainage areas or encounter gulleys, creeks, streams, etc. Total drainage structures will probably exceed 10,000 structures. Conceding the use of small diameter pipe or multiples thereof, in most instances, still a significant effect on the culvert pipe industry will result.

c. These structures will change drainage patterns, concentrate flows, increase erosion, and increase downstream deposition to some indeterminate degree. They will also prevent deterioration of project roads and permit use of project roads during inclement weather. If project roads are to intersect existing roads at grade, vertical clearance of new culverts will be a problem at many sites since existing drainage ditches are rather shallow, particularly on unpaved roads.

d. Relocation of some rural telephone and power lines will be necessary for vertical clearance of large vehicles on project roads. In ranching areas, some new fencing will be required to maintain control of livestock where roads intersect existing fences.

3. Roadway Design

Considering the extremely short design period remaining prior to FY-82 road construction, and recognizing that field investigation and survey for roadway design will be severely limited, consideration should be given to a Design and Construct type contract (1-step, 2-Step, performance spec, etc). The contractor would be given configuration and strength guidelines and have the latitude to make field deviations to avert obstructions and seek more advantageous field conditions.

E. Life Support Facilities

1. The requirement for a life support contractor is not as great in the Texas-New Mexico area as other remote areas due to the proximity of food, shelter, and other support facilities. This is particularly true in West Texas where the worker-farmer-rancher traditionally and habitually commutes comparatively long distances for services, supplies, and employment. Nevertheless, the impact of the relocation of upwards of 100,000 contractor and support personnel with dependents will require augmenting of available life services, especially in the New Mexico areas. Life support facilities will be of most urgency at the outset of construction operations, when the bulk of the New Mexican clusters are sequenced for construction, and to allay the initial psychological impact.

2. Obviously, the great bulk of housing and support facilities will have to come from either existing communities in the area or from temporary construction camps. Mobile homes would probably be the most inexpensive and easiest way of constructing temporary camps, whether or not they are within the city limits of local communities; streets, utilities and trailer pads are easy and fast construction, and the mobile homes will have salvage value at the end of construction. Water, telephone and electrical power for life support facilities during construction does not seem to be a significant problem in the New Mexico-Texas area providing the proper planning, coordination and

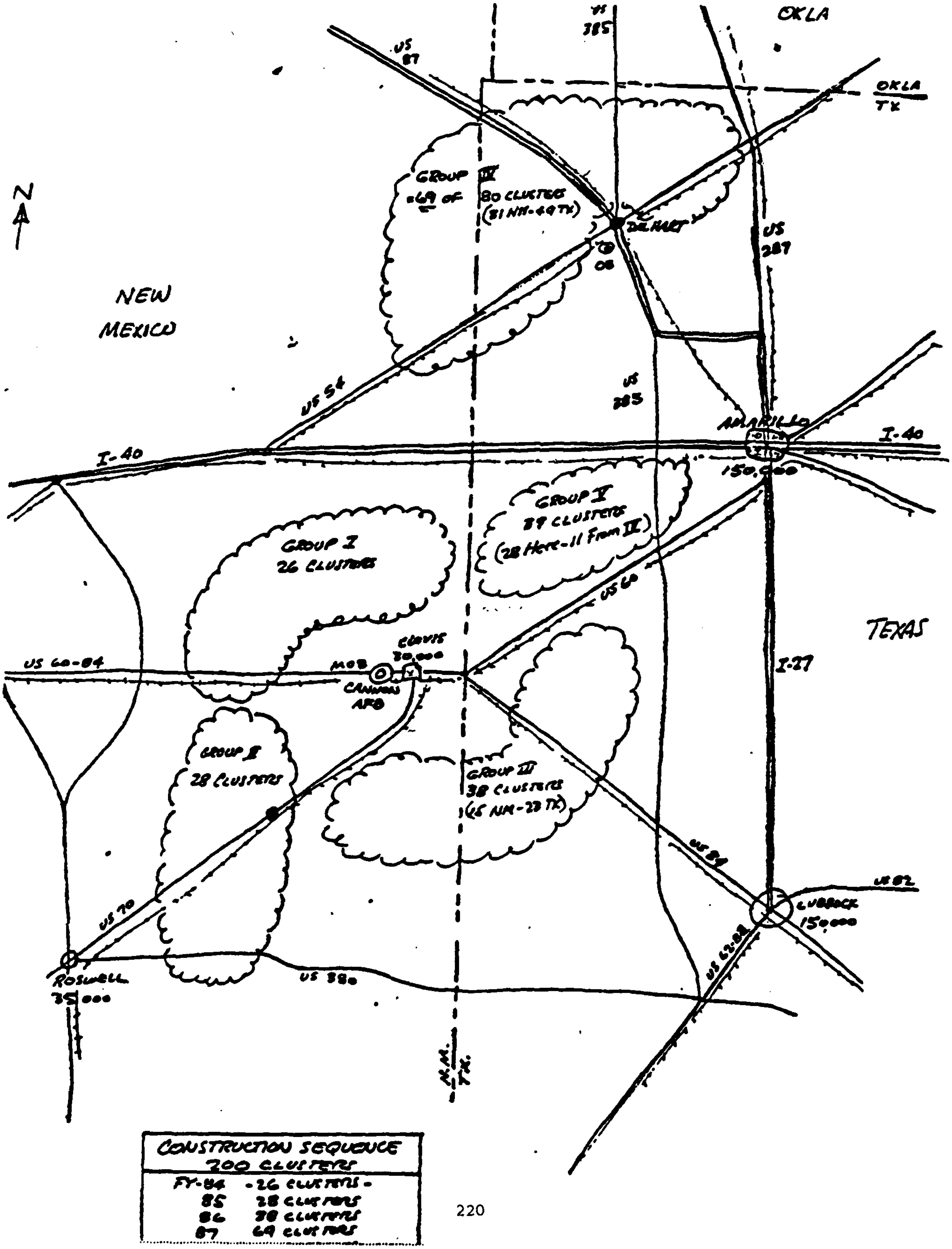
funding is consummated with local authorities. Sewage collection and treatment could be a sizable problem for some areas; the most palatable solutions appear to be package treatment plants or truck transport to existing treatment plants for processing in accord with prearranged fee. Another alternative which should be explored is land treatment of raw sewage, which is sometimes utilized in this area, notably in Lubbock, Texas. Trailer camps would also be relocatable to different areas within the entire construction site during the construction of the project. Zoning and spacing arrangements may be worked out within townships with some residual benefit to the latter by including provisions for leaving the utilities in place for township use and development after construction of the project is completed.

F. Water Supply

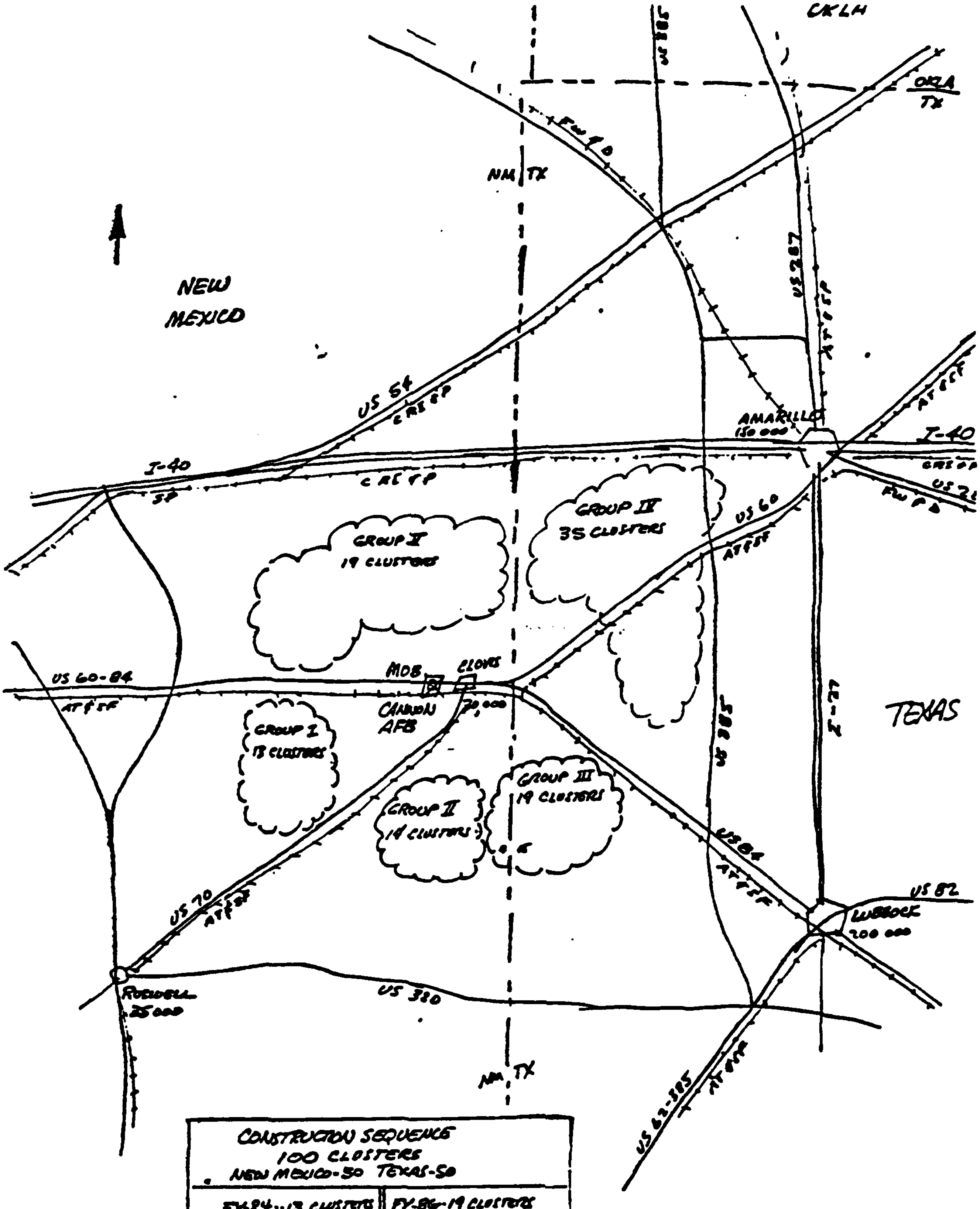
1. The single most critical factor affecting the selection, and subsequently, sequencing of construction operations is the availability of adequate water supply. All proposed sites are located in the High Plains area and are underlain by the Ogallala Formation. The area is used primarily for cattle grazing with substantial amounts of irrigated agriculture featuring soybeans, sorghum, and some cotton and wheat.

2. According to the USGS, the demand for surface water, primarily for irrigation, will triple by 2020. This increased demand will result from the ongoing and projected depletion of the ground water supply. The water in storage in the Ogallala aquifer is being depleted at an approximate rate of 3.5 million acre-feet per year. Since current surface water supplies are insignificant, and annual rainfall is low (16 - 18 inches), recharge to the aquifer is very small. The amount of recoverable water in the Ogallala aquifer was estimated at 140 million acre-feet in 1967. Average depth to water increased by 40 feet to a depth of about 150 feet from the middle 60's to the middle 70's; similarly, an average well depth of 200 feet may be projected for the middle 80's.

3. Summary: Although ample construction water is locally available, there are continuing studies being made, and the local populace are aware of a growing and future water problem. Resistance to further depletion may be expected; alternative use of purchased water should be considered.



OKLA
US 385
US 87
OKLA / TX
N
GROUP IV
=69 of 80 CLUSTERS
(31 NM-49 TX)
DALHART
US 287
NEW MEXICO
US 54
US 385
AMARILLO
150,000
I-40
I-40
GROUP V
39 CLUSTERS
(28 Here-11 From IV)
GROUP I
26 CLUSTERS
US 60
TEXAS
US 60-84
MOB
CLOVIS
30,000
CANNON AFB
I-27
GROUP II
28 CLUSTERS
GROUP III
38 CLUSTERS
(15 NM-23 TX)
US 84
US 82
LUBBOCK
150,000
US 70
ROSWELL
35,000
US 380
US 62-82
N.M. / TX.
CONSTRUCTION SEQUENCE
200 CLUSTERS
FY-84 - 26 CLUSTERS -
85 28 CLUSTERS
86 38 CLUSTERS
87 69 CLUSTERS



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